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P183

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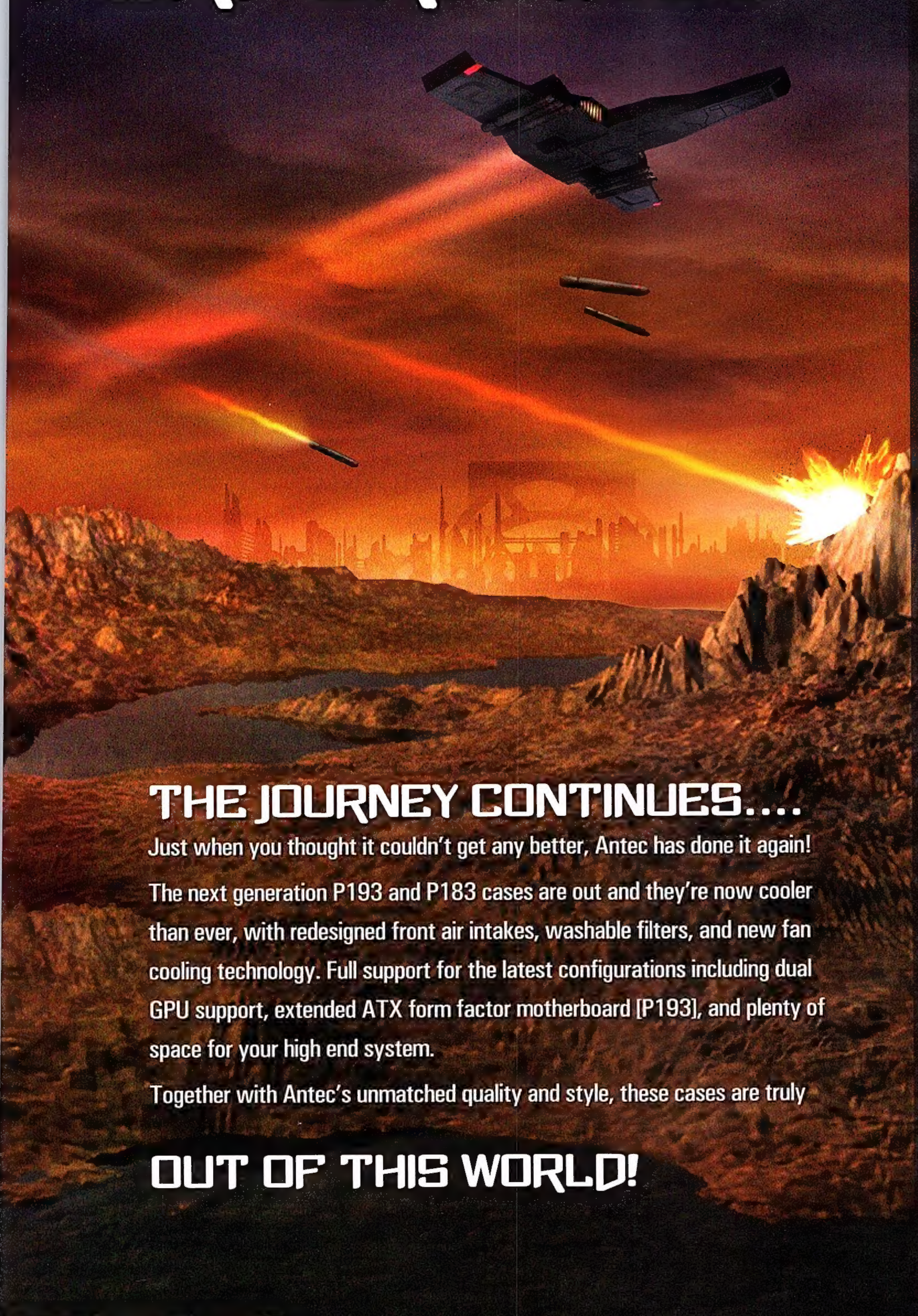

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EDHEAD

March to the guns!

So, we're still getting excited about Blizzard this month.

Actually, it's more accurate to say that Justin's getting excited. Me? I'm just getting jealous of all the great things he's telling me about the multiplayer in Starcraft II.

And how cool Blizzard Headquarters is. And how he got wined and dined by Blizzard's best and brightest. And...

Let's just say he's pretty excited.

Frankly, we can't blame him. Every screen we've seen, every video we've drooled over, seems to suggest that Starcraft II is going to be one hell of an RTS. I made the claim earlier in the year, possibly a little too boldly, that Empire: Total War was already claiming Game of the Year status. More than a few folks called me on that, wondering how I could say such a thing with SCII still to come!

Strategy games are an interesting genre, with a broad array of gameplay types under its wide belt. There's the detailed and anally simulationist crowd, like Empire, or some of the really huge WWII sims I've played that model such minutiae as degrees of slope and tank armour and the individual composition of that armour and how it reacts under high-velocity tungsten rounds (Ah, Combat Mission, how I love thee), and at the other end there's the easy to learn, ages to master rock-scissor-paper gameplay of Starcraft and many other RTS titles.

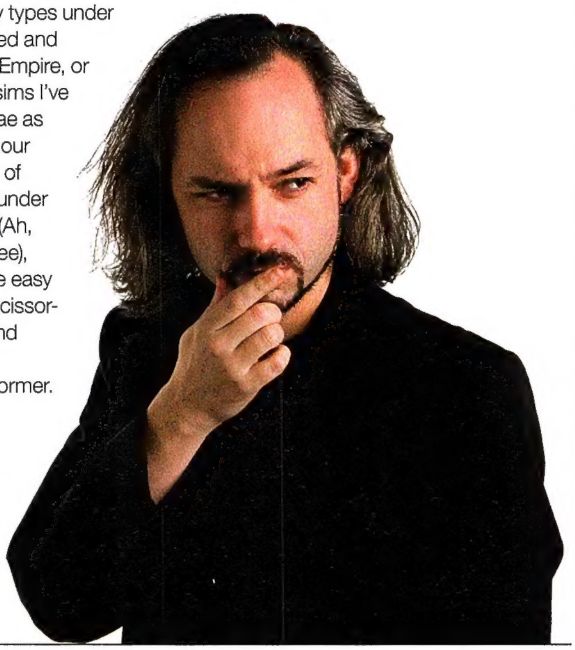
I have to admit, I prefer the former. Deep recreations of historical accuracy and technical detail. The kind of game I try to show off, but that usually makes people fall asleep at how slow and involved it all is, while I maniacally giggle at the entertaining complexity.

But then again, I giggle at a lot of things.

Which is not to say that I don't like Starcraft (or that I'm not looking forward to Starcraft II). I just get something else out of it. I remember a share-house I used to live in that had ethernet strung all over the house to facilitate cut-throat, pizza-fueled sessions of Starcraft. I invariably lost in proper PvP, but when we all teamed up against the AI, say three versus five against us, no one could turtle like I could.

Give me a line of bunkers supported by siege tanks and missile turrets and I'm a happy, well, camper.

David Hollingworth
dhollingworth@atomicmpc.com.au



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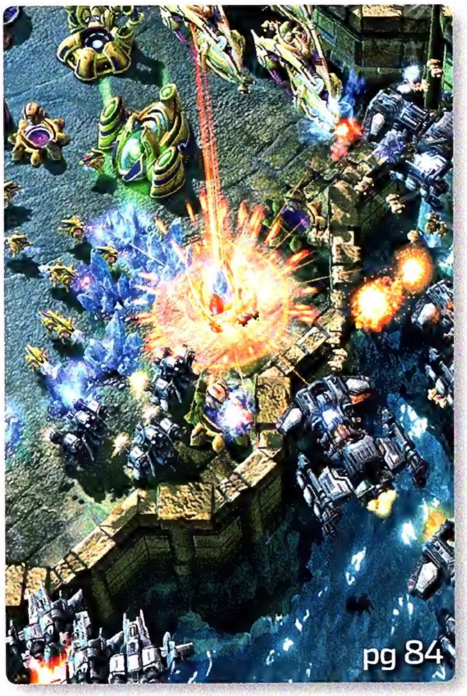

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PS3's Vidzone is live!

Stream music videos over the Playstation Network via VidZone - win!

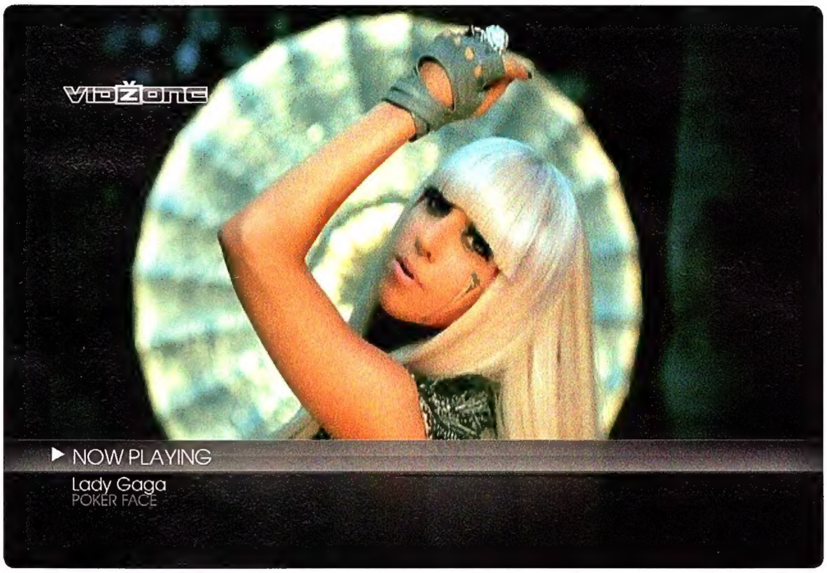
Sony's VidZone streaming service went live last month, via a free update available over the Playstation Network.

We saw the service in demo form a little while ago, and very much liked what we saw. The music content was limited back then, but as promised, there's a mess of content available at launch - three weeks' worth, claims Sony!

The 10,000 videos, with full surround sound. The service is ad-supported, and free to use; the labels already signed up are Sony Music (d'uh!) and Universal Music Group. Sony's in talks with EMI and Warner, and local reps are sanguine they'll be on board in the not too distant future. Aside from the big boys, there are also thousands of smaller independant labels signed up.

Even in the limited form we got to play around with, the service was pretty damn compelling, and we're looking forward to 'borrowing' the HQ's PS3 for some serious 'testing' over the weekend. With the ability to populate a full playlist, save searches, and integrate with your PSP, this is a perfect addition to the PlayStation's Blu-Ray functionality.

We hear it even plays games. Who knew?!



Radioactive wasps give workers a buzz

Wasps go nuclear!

Radiation and pretty much anything else in science fiction usually results in some kind of giant man-eating being that most likely will end up destroying Tokyo or New York, but this is sadly the real world.

Lack of destruction aside, workers have discovered colonies of wasps that have moved into a nuclear test site in Washington where nuclear devices were tested for their effectiveness.

Since these wasps build their nests out of mud and other organic pieces (which were irradiated from the testing) it seems the wasp have picked up a decent amount of radiation themselves!

It's not in any kind of dose that is likely to be passed to humans enough to kill, but workers still have to remove the insects to continue working - up to thousands of wasps at a time have been buzzing around.

Will these little bugs grow into something like Fallout 3's bloatfly? Only time will tell!

Red Dead release slips to next year

We may be getting a little excited about the upcoming open world western from Rockstar, Red Dead Redemption. There's a distinct possibility we're laying in a supply of cowboy hats, jerky, cheap whiskey and chewin' tobaccy to see us through some marathon gaming sessions.

And now, there's also the distinct possibility we won't be seeing the game until April 2010.

The announcement stealthily snuck out in the Take 2 Interactive's second quarter fiscal results, claiming that the slipped date is "to allow additional development time for the titles and to maximize their full potential in terms of the quality of the player experience and market performance."

In other words, they're just not ready yet; but it will be some time in the first fiscal half year of next year. That's a window from November this year to April next. Given the above statement, we're not exactly sanguine that we'll see it any time this year.

Darn it.

FROM ATOMIC ONLINE

It's Post of the Month time again, and there's been a range of great stuff on the forums: cool tech, gaming and important life lessons. So who's got the best of the bunch? Who's going to walk away with a shiny CyberSnipa Stinger mouse?

It's **elfinke**! For talking up E3! **http://forums.atomicmpc.com.au/index.php?showtopic=17027&st=0&#entry337510**

Runners up

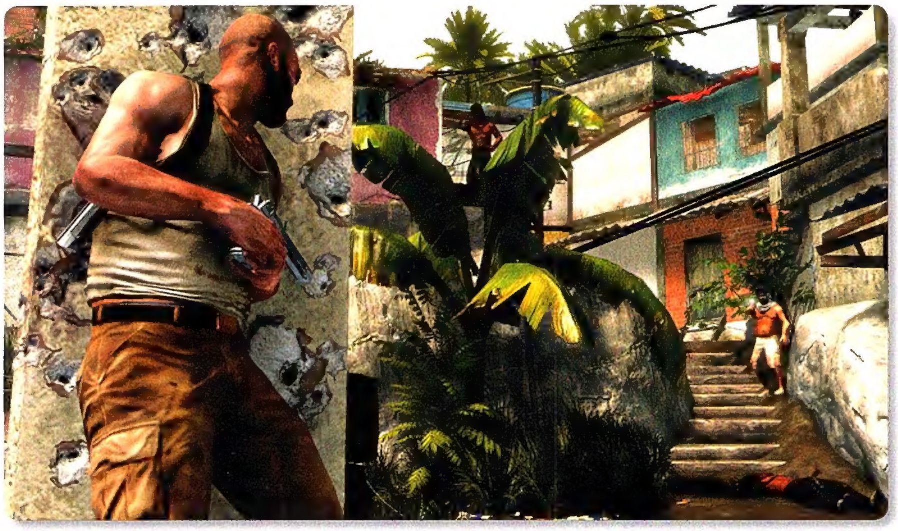
Will **TransmissionDump** become the new ruler of our CommunoCapitalism future? **http://forums.atomicmpc.com.au/index.php?showtopic=15964&st=0&p=318056&#entry318056**

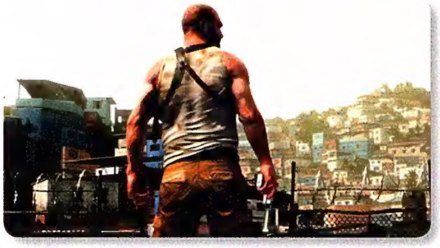
An end of a PAC era as **Tak** moves house: **http://forums.atomicmpc.com.au/index.php?showtopic=17148**

TheSecret on Linux distros: **http://forums.atomicmpc.com.au/index.php?s=&showtopic=17132&view=findpost&p=339991**

Kurai's post about depression and self-harm: **http://forums.atomicmpc.com.au/index.php?s=&showtopic=16914&view=findpost&p=337755**

Of course, that's just the merest taste of the cool stuff on the Atomic forums, so be sure to check 'em out when you have a chance.





Max Payne 3

New in-game shots, and details of the game's setting and story. Bring. It. On.

Max Payne and its sequel are seminal PC shooters. Rich with story, blessed with cutting edge (for the time) graphics and physics, and with a main character that's more noir than a bar full of drunk LA private eyes. We're expecting the third in the series this summer, and at last we're getting an idea of what this new episode will be about, and what the game's going to look like.

Max Payne 3 is set 12 years after the last game, and Max has moved on from his dark past. Moved on all the way to Sao Paolo in Brazil, where he's doing bodyguard duty for a wealthy local family. He's spent the years acting as a security consultant and odd-jobs man - and getting kinda old, as you can see in the pics.

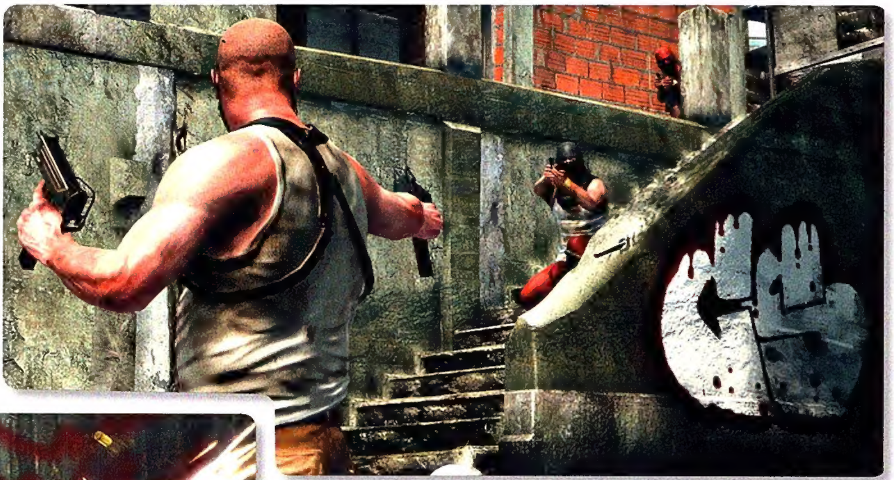
He's fallen about as far as an ex-cop can fall, but as the game opens he's about to discover that trouble still follows him like a lovelorn dame.

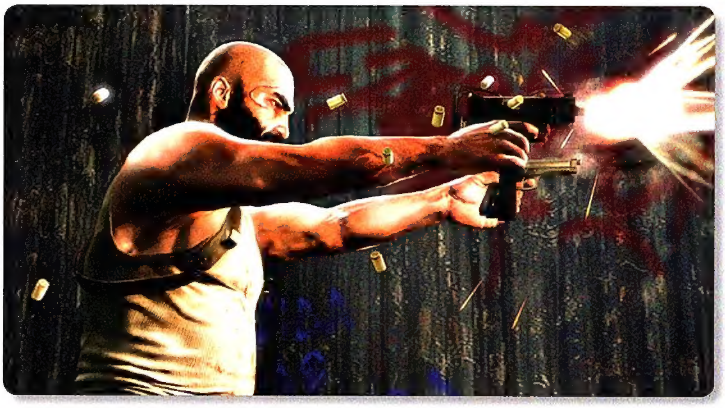
The game's going to feature Rockstar's RAGE engine, along with Natural Motion and a new particle physics system to deliver deadlier than ever combat and more natural environments. Dual-wielding is looking to be more flexible than ever, and the game will even boast an intelligent cover system; Max? Cover? Yeah, we don't think he needs it either.

And the painkillers are back, too. Wouldn't be Max Payne without 'em.

Rockstar's chosen Sao Paolo as the setting as it wil deliver some unique combat environments, and because of the city's long association with crime and excess. From the screens, it looks as though a lot of the action will take place in the sprawling slums of the city, and we've no doubt we'll also see shining drug mansions, corporate enclaves (what's a Max Payne game without corporate intrigue?) and more.

We can't wait to see this game come to release. It'll be out this summer, on all major platforms. Check out the pics in the meantime!





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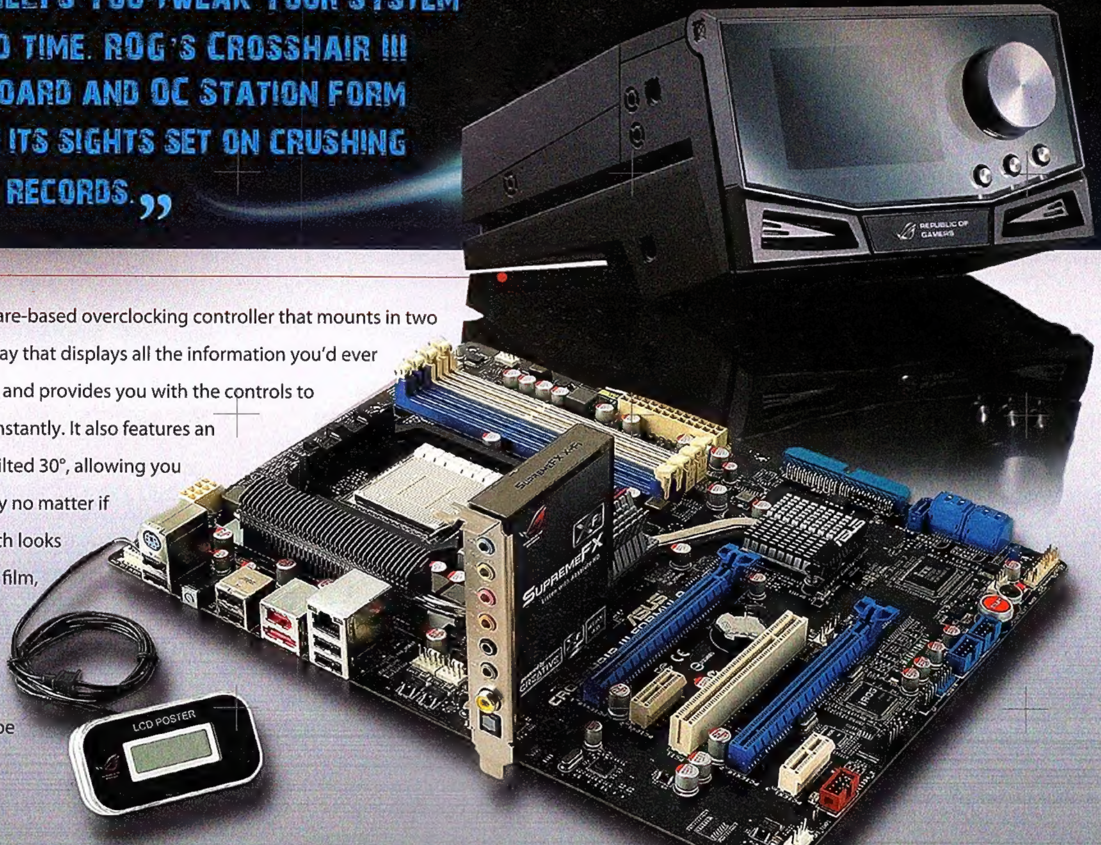

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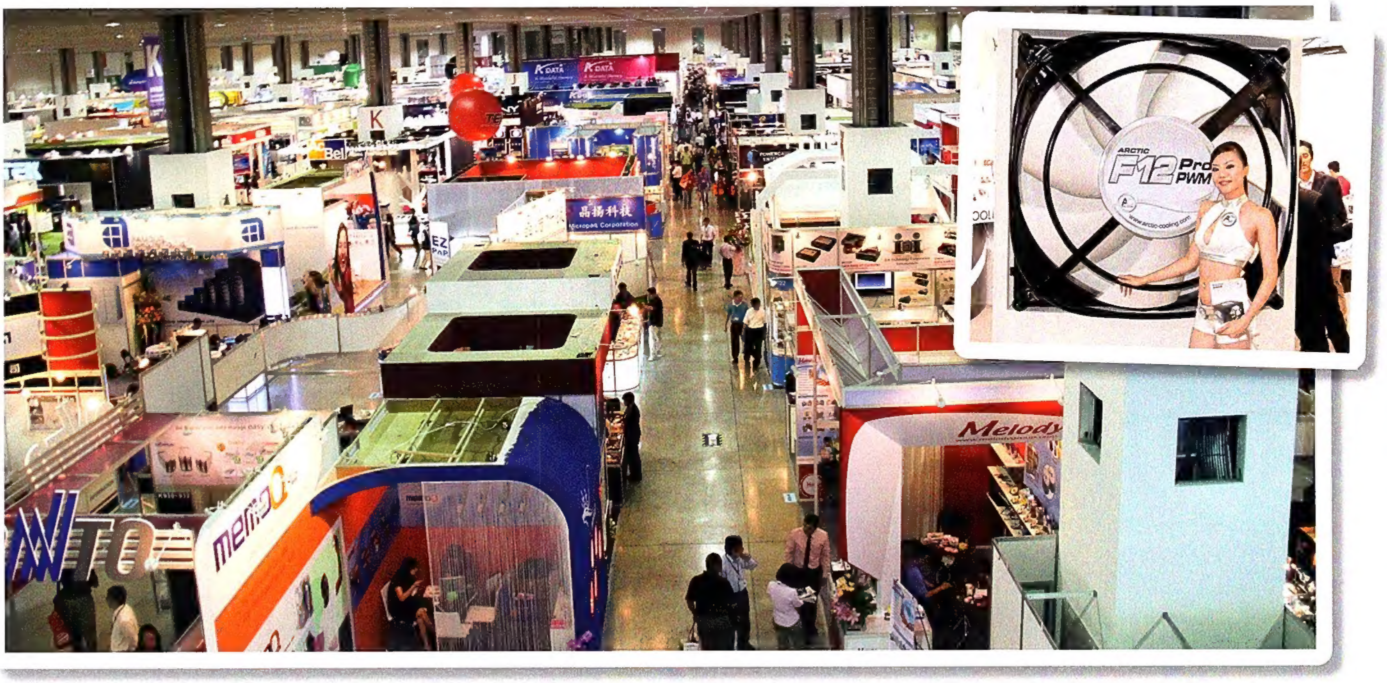


Computex 2009

Justin Robinson heads to Taipei for the biggest tech show evar.

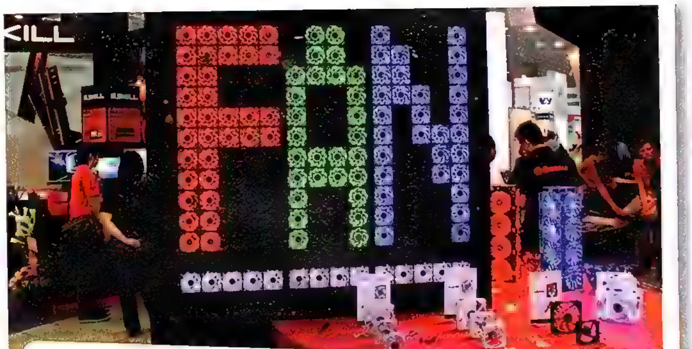
Computex is hands-down the biggest tech exhibition in the entire (known) universe, throwing 1,712 exhibitors together underneath four large halls. With thousands of kilometres of power cabling, millions of watts of wireless signals and more light being thrown around than your average discothèque (or ten!), the sheer amount of resources poured into this show every year all culminate in one thing – more tech than anyone could ever hope to see.

Thankfully as of last year an entirely separate venue was constructed for component manufacturers. It was there at Nangang that we spent most of our time, wandering around with a cheek-to-cheek grin at all the excitement and buzz that the show seemed to generate. Computex is a big deal for a lot of manufacturers; as they get to show off all their latest kit to the media, business partners and the rest of the world.

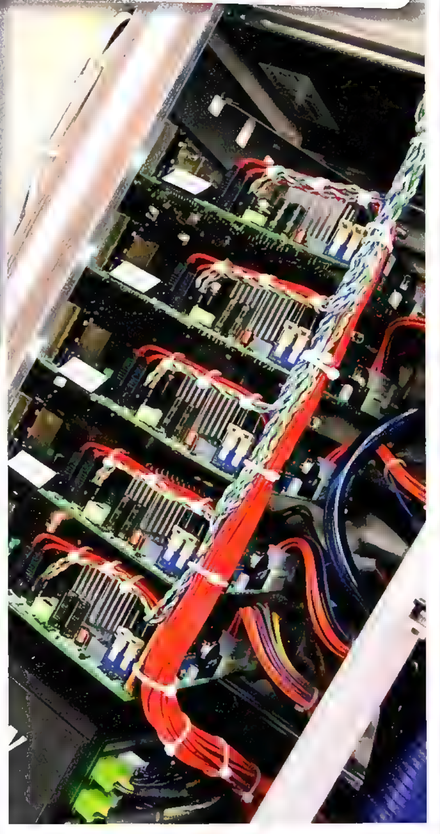
Arriving on the very first Monday, we dumped our gear at the hotel and zipped off to the very first presentation by NVIDIA (admittedly at a time that hardly any foreign media could actually attend!) about its upcoming technologies. Disappointingly it didn't mention anything about hardware save for the 3DVision glasses and ION, leaving us without any promise of 40nm silicon nor a GT300 core. Nvidia showed off its usual PhysX prowess along with some other technical demonstrations, and the big NVIDIA boss pranced across the stage enthusiastically during the show.

Day 2 brought us to the Thermaltake booth, with some babes and the eternally impressive Level 10 case being shown off (see both online here: **www.atomicmpc.com.au/?146660**). We swung by the GIGABYTE booth to check out all its newest motherboards and graphics cards, as the company plans its P55 chipset launch with a whole range of mobos ready for the next Intel chip. Coolermaster also had some nifty things to show off at its booth – most interesting was its ATCS 840 case, which Coolermaster's crammed five ITX boards into – complete with a quadcore and watercooling! It had more number-crunching power than the average system by a huge amount, though limited space meant that no graphics card could be used.

We briefly dropped by the Enermax booth,



Windows Embedded
GIVE YOUR TEAM THE PLATFORM TO DELIVER
NEXT-GEN CONNECTED DEVICES—FASTER.
CONFIDENCE



and saw they'd amusingly made the word FAN out of 120mm LED fans. Sure it might not do much practically, but it was attention-grabbing! Not to be outdone by anyone else, memory manufacturer PNY also had its booth up and running with a Vegas-themed setup complete with giant poker chips and slot machines. PNY didn't try to get us to gamble (though they did hand us a few press kits).

Day 3 was the illustrious GoOC competition run by GIGABYTE, where the world's top overclockers competed against each other for top spot. Won by Team USA contestants *Fugger* and *Vapor*, it wasn't quite as grand a scale as the previous year but was just as fierce. Most surprisingly was that most of the tech seemed to survive the assault!

Day 4 brought us to XFX's booth, where the company was showing off its very firstest and bestest power supply. Rated at 850W it also comes with an incredibly stylised casing, complete with channels cut into the top and a very neat fan guard. It'd be fantastic in a windowed case! We also checked out the Microsoft booth, which had Windows 7 everywhere, as well as Windows Embedded running a giant yellow simulator. Apart from the usual craziness we got to try out the 3DVision glasses there too – in an FPS the effect made it hard for our eyes to focus, but in Burnout the effect was incredible.

There's too much to cover for the show on these few pages, so head online to the site to check out all the articles we've done at **http://www.atomicmpc.com.au/Topic/146727,computex-2009.aspx** **JR**

GEARBOX

All the best and coolest gadgets & gear.

1.

2.

3.

4.

5.

1. Aeron inspired chair

Price $224 **Website** www.milandirect.com.au

The Aeron is the God of Chairs. It sits atop a desk-shaped mountain, giving favours to its followers and smiting unbelievers with back pain and poor circulation. It is the chair, if Jesus were a gamer, that the Son of God would play in.

It's also about $1500! You could buy a new Core i7 setup for that! But there's an alternative: this 'aeron inspired' chair from Milan Direct.

There's no shame in being honest, and this cheaper version of the Aeron is plenty comfortable. With adjustable lumbar support, back tension, height and armrests, this is the ultimate enthusiast's chair. Whether you're spending hours achieving the perfect overclock or benchmark run, or simply grinding rare drops in your MMO of choice, your arse will thank you for treating it to this mighty chair.

2. Seagate FreeAgent Theatre

Price $199 **Website** www.seagate.com

We've always kinda dug Seagate's FreeAgent external drives – they're sleek, convenient, and backed by Seagate's usual drive reliability. That convenience has now been ramped up even further with the release of the FreeAgent Theatre media player.

The Theatre is a neat little docking station you can plug slot your external drive into. It then plays back videos in full HD, lets you run slideshows, or play music from the inserted drive. It's even got a USB port, so you can play stuff off a handy stick – we've got about 60GB of USB storage spread over a couple of dozen sticks around HQ, so we like this. It's a neat alternative to having a network-connected media player, and ideal if a lot of your friends and family have FreeAgent drives – you'll be able to share content cleanly and easily.

3. Creative ZEN MX

Price $219 **Website** http://au.store.creative.com

There's convenience that sits next to your television, and then there's convenience that fits into your pocket – like the Creative ZEN MX.

This latest MP3 player from one of the flagship vendors of the product features a bright 2.5in screen to look at photos, easy to navigate (and customise!) controls, and it simply plugs into your PC ready to move music around without any fuss.

But what we like most about it is that it features an SD card slot, meaning you can expand the onboard memory easily, swap songs from other users on the road, or even create an entire library of music-loaded SD cards to suit any mood.

Neato.

4. Digishow pocket projector

Price $399 **Website** www.digishow.com.au

Here's a neat little toy we saw in action at the recent CeBIT tech show in Sydney. It's a pocket projector designed to work with mobile phones, laptops, portable media players and digital cameras.

It's tiny enough to literally fit a in pocket, and projects sharp and bright VGA images at 640 x 480 pixels in 24-bit RGB colour. What's more, we also saw adaptors for gaming consoles, letting you play your favourite games without a television – a neat little trick that means you don't have to find a mess of televisions for a casual Xbox LAN at a mate's place.

5. Gigabyte GM-M7800S mouse

Price Most likely exorbitant **Website** www.giga-byte.com

"Once you hold it, it creates outstanding touch and gives you incredible hand feel."

When a product comes across our desk making this claim, you just know it's going to be entertaining at the very least. And we're not wrong.

Gigabyte's latest mouse is an exercise in overstated style over substance – a Swarovski-crystal accented wireless controller complete with stitched leather covering and gold-plated metallic highlights.

Yup. Just the thing I want to see all my hand-sweat soak into. Maybe that's what they mean by 'hand feel'?

The myth of memory

Oodles of memory is all good, right? Kinda. The truth is, too much of it is probably going to waste. **Ashton Mills** raises your (large address) awareness.

There's a lot of hoo-hah at the moment about memory, especially with the rise of 64-bit operating systems and Core i7 practically re-defining the base volume as 6GB. And certainly, as memory has come down in price and with memory vendors always wanting you to buy more, the theme at the moment is that when it comes to memory, more is always better.

Only that's not always the case.

Having memory in your system is not the same as it actually being put to use. For the most part, this is a function of the heritage of both operating systems and applications. You may be sitting on a beefy 6GB or more system, but a large chunk of it may never actually make a difference, and the money spent on it is wasted.

How do you know if your uber-gigs are working hard? That depends on how much you actually need, and this is first dependent on how much you can *actually* use.

Which is not as simple a statement as it sounds.

How much do you really use?

Having a 6GB system is good for the e-peen stakes, but is nothing more than a hole in your wallet if you use little more than 2GB. And, for most people, this is often the case.

Clearly, the type of applications you run will determine how much memory is taken up as demanding programs like games and image and video editing can eat up lots, as does running many large applications at once. But this doesn't apply to most of us. And, more importantly, even if you do you may not realise that many of your programs are actually artificially limited to 2GB anyway, meaning much of your memory still isn't being used.

What about games? Even ball busting cutting-edge games can find it hard to push 2GB. And since when you play games these are usually the only main application you run, again that extra 4GB on your 6GB system isn't doing anything.

Any more than this, unless you happen to be working at WETA, is probably going to waste on a home system.

Part of the problem lies in how much memory is actually *useable* as opposed to how much you have installed. But, you say, I'm running a 64-bit OS so I *am* making best use of all my RAM! Well, actually, not entirely. The operating system is only one part of the equation – the applications you run determine how your memory is used, too (more on this below).

Finding how much you use isn't as simple as pulling up Task Manager to see, either – in fact if this is what you do to measure memory usage you're using the wrong tool. In addition to the memory programs use, there's also what the operating system uses and what's been assigned to cache – this latter is important, as the cache can grow as long as there is memory for it to expand, but beyond a certain point a large disk cache doesn't really do much for you. Meaning, if that's where much of your RAM is going, you'd probably have been better not getting that last 2GB module and just saving your dough.

At the moment 4GB will often do even for the most demanding games and programs (previous era Core 2 and similar systems), and 6GB (thanks to Core I7's three channels) is plenty for now. Any more than this, unless you happen to be working at WETA animating the next block buster movie, is probably going to waste on a home system.

If you want to see how much you're using and specifically how much individual programs suck up, grab System Internal's Process Explorer at **http://download.sysinternals.com/Files/ProcessExplorer.zip**.

Physical vs virtual

Regardless of how much actual *physical* RAM you have installed, applications run in their own *virtual* address space. For a 32-bit application under Windows, this is 2GB. The application doesn't have to use that much, but can if it wants to and it's up to the operating system to deliver while also keeping all other applications (including system processes) happy.

And you know what happens when the combined load of memory requested by applications exceeds physical RAM: the operating system starts swapping out to disk (actually the science of memory management will often pre-emptively swap out background programs to allow foreground ones to be more responsive as memory is required, and other such tricks).

If, of course, you do have plenty of RAM installed and the application does want to allocate lots of it, then it can do so, but it's limited by the addressable space the application can see. By default Windows limits a 32-bit application to 2GB, and if it tries to allocate more than this it will fail. Sometimes gracefully, sometimes spectacularly. Either way, it doesn't matter if you have more physical RAM, it can't be used by the program.

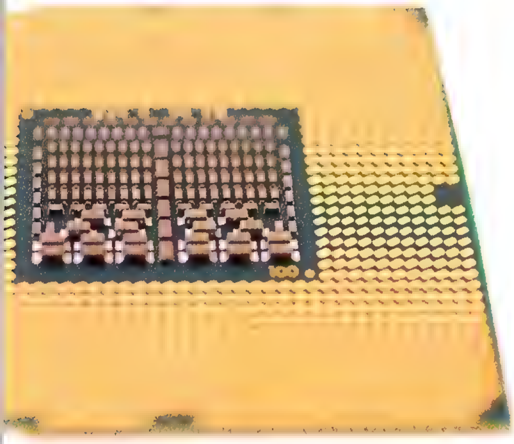
And this is true even if you're running 64-bit Windows. Remember, with 64-bit Windows the operating system itself can see and use more than the 4GB limitation of 32-bit Windows, but that doesn't mean applications can. A 64-bit application has a very large addressable space assigned to it by Windows – a gigantic 8TB. But as mentioned before, even today the majority of applications for Windows are still 32-bit, and with very rare exceptions, so too are games. So having 6GB to play COD4 is moot.

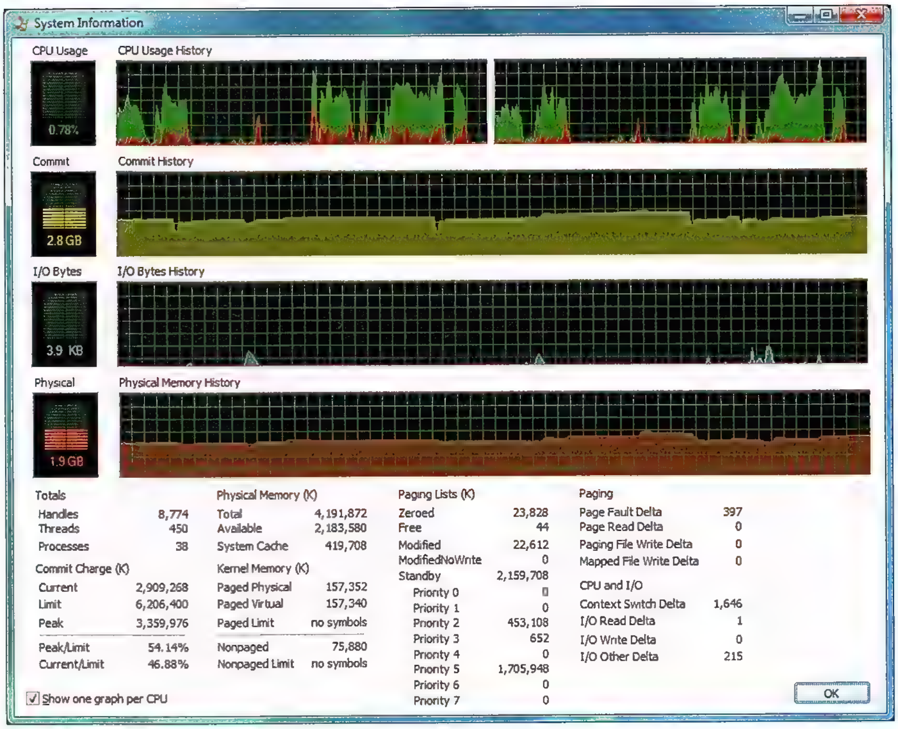
Overall, the breakdown looks like this for addressable space per program:

32-bit application on 32-bit Windows: 2GB

32-bit application on 64-bit Windows: 2GB

64-bit application on 64-bit Windows: 8TB





```
Totals                          Physical Memory (K)            Paging Lists (K)                Paging
 Handles           8,774        Total           4,191,872      Zeroed            23,828        Page Fault Delta          397
 Threads             450        Available       2,183,580      Free                  44        Page Read Delta             0
 Processes            38        System Cache      419,708      Modified          22,612        Paging File Write Delta     0
                                                               ModifiedNoWrite        0        Mapped File Write Delta     0
Commit Charge (K)               Kernel Memory (K)              Standby        2,159,708
 Current       2,909,268        Paged Physical    157,352        Priority 0           0        CPU and I/O
 Limit         6,206,400        Paged Virtual     157,340        Priority 1           0        Context Switch Delta    1,646
 Peak          3,359,976        Paged Limit    no symbols        Priority 2     453,108        I/O Read Delta              1
                                                                 Priority 3         652        I/O Write Delta             0
 Peak/Limit       54.14%        Nonpaged           75,880        Priority 4           0        I/O Other Delta           215
 Current/Limit    46.88%        Nonpaged Limit no symbols        Priority 5   1,705,948
                                                                 Priority 6           0
☑ Show one graph per CPU                                         Priority 7           0
```

Memory usage on 64-bit Vista after a while running Fallout 3. A total of 1.9GB is currently being used, but note that 420M of this is cache. Even on a 4GB system much of the memory is unused.

Which isn't good news for modern games. More and more are becoming demanding of available memory, but without the move to 64-bit – which so few game developers are willing to do – they will either not benefit from more memory (even using it as a local cache) or they will simply bomb out when they reach the 2GB limit of their addressable memory. Which is precisely what happens with Flight Simulator, STALKER, and Supreme Commander, and why some enterprising users have taken it into their own hands.

Large Address Awareness

Remember that the 2GB limit on 32-bit applications is a limitation imposed by the operating system. This wasn't arbitrarily chosen, it's a restriction that ensures no matter how much memory an application needs, there will still be memory for the operating system itself. On 32-bit Windows 4GB is the entire addressable space, and the operating system needs to fit within this as well as address hardware and provide for applications.

But on 64-bit Windows the operating system doesn't need to squeeze into the lower 4GB, meaning more addressable space can be freed up for programs. And, although it may have a negative impact on the operating system, you can even tell 32-bit Windows to give a little more back to the programs and divide memory into a 3/1 split, giving 1GB to the operating system and 3GB to programs.

The only requirement is that these programs are linked at compilation time to be *large address aware*. Since you or I don't have access to the source code, we can't re-link programs to use a larger address space. Fortunately, you don't have to, as some basic tools will alter the headers on them for you.

Using large address awareness, the breakdown looks like this for addressable space per program:

32-bit application on 32-bit Windows: 3GB

32-bit application on 64-bit Windows: 4GB

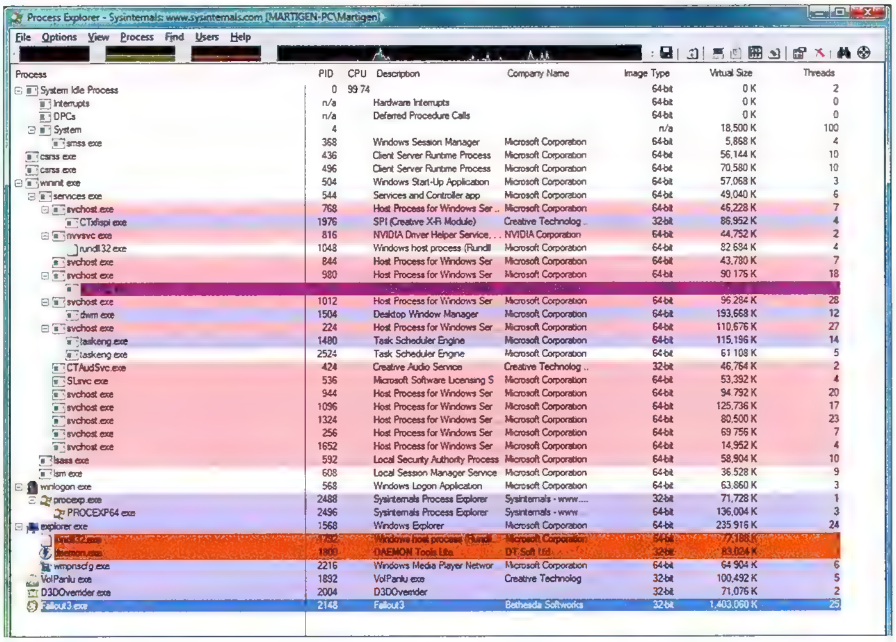
64-bit application on 64-bit Windows: 8TB

As you can see there's a doubling of the range even for 32-bit applications on a 64-bit system, but if it's not already clear the best scenario is to run 64-bit applications on a 64-bit operating system. You don't have to tweak anything here, as the 8TB limit for 64-bit applications is quite spacious, at least for now.

Expanding the addressable space

The procedure for altering the headers of a program is pretty simple, but note one big caveat: not all programs will be happy with this, because they simply weren't designed for it, and may crash and burn horribly.

First grab one of the many tailored scripts (search on 'large address aware' and game title) for Flight Simulator, STALKER, Supreme Commander or Fallout 3. You can get the Fallout 3 one for example from here: **www.fallout3nexus.com/downloads/file.php?id=6510**


Process Explorer - Sysinternals: www.sysinternals.com [MARTIGEN-PC\Martigen]
File
Options
View
Process
Find
Users
Help

Process	PID	CPU	Description	Company Name	Image Type	Virtual Size	Threads
System Idle Process	0	99 74			64-bit	0 K	2
Interrupts	n/a		Hardware Interrupts		64-bit	0 K	0
DPCs	n/a		Deferred Procedure Calls		64-bit	0 K	0
System	4				n/a	18,500 K	100
smss exe	368		Windows Session Manager	Microsoft Corporation	64-bit	5,868 K	4
csrss exe	436		Client Server Runtime Process	Microsoft Corporation	64-bit	56,144 K	10
csrss exe	496		Client Server Runtime Process	Microsoft Corporation	64-bit	70,580 K	10
wininit exe	504		Windows Start-Up Application	Microsoft Corporation	64-bit	57,068 K	3
services exe	544		Services and Controller app	Microsoft Corporation	64-bit	49,040 K	6
svchost.exe	768		Host Process for Windows Ser ..	Microsoft Corporation	64-bit	46,228 K	7
CTxfispi exe	1976		SPI (Creative X-Fi Module)	Creative Technolog ..	32-bit	86,952 K	4
nvvsvc exe	816		NVIDIA Driver Helper Service, . .	NVIDIA Corporation	64-bit	44,752 K	2
rundll32 exe	1048		Windows host process (Rundll	Microsoft Corporation	64-bit	82 684 K	4
svchost exe	844		Host Process for Windows Ser	Microsoft Corporation	64-bit	43,780 K	7
svchost exe	980		Host Process for Windows Ser	Microsoft Corporation	64-bit	90 176 K	18
[redacted]							
svchost exe	1012		Host Process for Windows Ser	Microsoft Corporation	64-bit	96 284 K	28
dwm exe	1504		Desktop Window Manager	Microsoft Corporation	64-bit	193,668 K	12
svchost exe	224		Host Process for Windows Ser	Microsoft Corporation	64-bit	110,676 K	27
taskeng.exe	1480		Task Scheduler Engine	Microsoft Corporation	64-bit	115,196 K	14
taskeng exe	2524		Task Scheduler Engine	Microsoft Corporation	64-bit	61 108 K	5
CTAudSvc.exe	424		Creative Audio Service	Creative Technolog ..	32-bit	46,764 K	2
SLsvc exe	536		Microsoft Software Licensing S	Microsoft Corporation	64-bit	53,392 K	4
svchost exe	944		Host Process for Windows Ser	Microsoft Corporation	64-bit	94 792 K	20
svchost exe	1096		Host Process for Windows Ser	Microsoft Corporation	64-bit	125,736 K	17
svchost.exe	1324		Host Process for Windows Ser	Microsoft Corporation	64-bit	80,500 K	23
svchost.exe	256		Host Process for Windows Ser	Microsoft Corporation	64-bit	69 756 K	7
svchost exe	1652		Host Process for Windows Ser	Microsoft Corporation	64-bit	14,952 K	4
lsass exe	592		Local Security Authority Process	Microsoft Corporation	64-bit	58,904 K	10
lsm exe	608		Local Session Manager Service	Microsoft Corporation	64-bit	36.528 K	9
winlogon exe	568		Windows Logon Application	Microsoft Corporation	64-bit	63,860 K	3
procexp.exe	2488		Sysinternals Process Explorer	Sysinternals - www....	32-bit	71,728 K	1
PROCEXP64 exe	2496		Sysinternals Process Explorer	Sysinternals - www ...	64-bit	136,004 K	3
explorer exe	1568		Windows Explorer	Microsoft Corporation	64-bit	235 916 K	24
rundll32.exe	1732		Windows host process (Rundll...	Microsoft Corporation	64-bit	77,188 K	[illegible]
daemon.exe	1800		DAEMON Tools Lite	DT Soft Ltd	32-bit	83,024 K	[illegible]
wmpnscfg.exe	2216		Windows Media Player Networ	Microsoft Corporation	64-bit	64 904 K	6
VolPanlu exe	1892		VolPanlu exe	Creative Technolog	32-bit	100,492 K	5
D3DOverrider.exe	2004		D3DOverrider		32-bit	71,076 K	2
Fallout3.exe	2148		Fallout3	Bethesda Softworks	32-bit	1,403,060 K	25

Fallout 3 uses around 1.4GB on average on its own (see last entry in process list).

If you're applying this to Fallout 3, following the instructions and running the batch file is all you need to do. But the batch file only scripts the utilities bundled in the archive – you can use them for any program, game, productivity application or otherwise. There's actually only two you need to use, *dumpbin.exe* and *editbin.exe*. To add the large address aware header to a program open up a command prompt and run:

```
editbin /LARGEADDRESSAWARE
[application]
```

To remove it:

```
editbin /LARGEADDRESSAWARE:no
[application]
```

To see if if a program is enabled run:

```
dumpbin /headers [application]
```

and look for 'Application can handle large (>2GB) addresses' at the top of the output.

Why would you want to remove it? For one if it doesn't work well, and secondly to restore an EXE back to its original state, which game patches may require before they'll update it. In fact, note that some games may not let you do this at all, thanks to DRM (Digital Restrictions Management) schemes, especially Starforce, as these detect if an executable is modified.

If you're running 64-bit Windows, you don't need to do anything else. If you're running 32-bit Windows XP or Vista, there's one more step you need to do. For Windows XP: click My Computer > Properties > Advanced > Startup and Recovery, then click on Settings. Next click Edit to edit the BOOT.INI, and append:

```
/3GB /userva=2900
```

This enables what Microsoft calls *4GT RAM Tuning*. The 'userva' option allows you to tailor how much extra addressable space is used instead of the default 3072 (3GB). You can try without it, but some reports suggest Windows XP and its drivers (presumably, and especially with large-VRAM graphics cards using up addressable space) giving XP more than 1GB. Certainly this will be the case if you're packing SLIed 512M or more cards.

For Vista simply open a command prompt and run:

```
bcdedit /set IncreaseUserVa 3072
```

Using large address awareness will allow you to use more of your memory for those programs that could make use of it, but on the whole even including such demanding programs you would need to be using content creation programs editing very large files to make use of any more than a few gigs of memory on a home machine. For most users, including gamers, money spent on extra memory could probably be better spent elsewhere.

Alienware M17x

Intel® Core™2 Quad processor Q9000 (2GHz/ 1066 FSB/ 6MB Cache) CPU
SLI™ Dual 1GB GDDR3 NVIDIA® GeForce® GTX 280M Graphics Card
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INPUTOUTPUT

Dan Rutter brings the answers to your questions like no-one else can.

I/O OF THE MONTH

You'll need a microscope and a very small compass...

I Recently, I got distracted while setting up gear at a LAN party, and plugged the 4-pin power connector from my Philips IDE enclosure into my X-Craft one. The light came on rather dim, and a high-pitched noise came from the hard drive. I immediately shut it off, and noticed the smell of burning electronics coming from the enclosure.

Furthermore, I then found that I forgot to bring the real adapter for that enclosure. Someone else offered to plug the drive into their PC to test it, and smoke rose from the circuit board of the drive when it was attached.

The enclosure, however, does work with another drive in it, which is a little unexpected. I looked at the power supply I used, and the one that came with the drive, and basically, they have the 12 and 5v pins reversed with regards to each other. Why can't manufacturers just agree?

I presume at this point, the drive is dead. Of course, as things go, there was some un-backed-up data on there that I'd like back. I believe that the drive/platters/heads are all still fine, it's just the controller board on the bottom of the drive that is fried since all the 5v electronics received a rather unwanted 12. I take it that I'd need to search for a drive that is the exact same model, revision and capacity (it's a Samsung HD753LJ RevA 750GB) in order to do this? Or can I be less exact? Do you have experience or any tips with this sort of thing?

Geordie Millar

O I think more computer failures should involve smoke. If you've got to have some hardware crap out on you, it at least ought to do it in style.

There are several ways in which this precise symptom-set could arise. If I were guessing, I'd say the original connecting of the wrong power supply caused some regulator or chip to fail into a power-pin short-circuit, then the PC's beefier power supply cheerfully gave that component 25 amps or whatever to complete its destruction.

I/O OTM

WINS A LOGITECH G5!

There's a mouse in the house. Okay, it's not in the house, it's in I/O. And it looks damn good.

It's likely that the data on the drive's platters is A-OK, and slightly less likely that the drive remains mechanically functional. It wouldn't surprise me if the motor or heads have been barbecued. I also wouldn't be surprised if a new controller board revived it, though.

Controller-board swaps are, however, a painful process. It's usually quite easy to actually swap the boards (remember to take anti-static precautions; ESD-discharging wrist straps are about $6 on eBay), but it's getting the right board that's the tricky bit.

As you say, you'll need to find not just the right model of drive, but also the same 'stepping' and/or firmware revision, which you can probably figure out by looking at the old drive. (A later firmware may also work; an earlier one probably won't.) You shouldn't expect a board-swapped drive to be reliable; bad-block mapping and other low-level voodoo may be messed up, so you should just read the data you need off it and then consign it to the grave.

On the plus side, if you get a board-donor drive and the board doesn't work, you should be able to swap it back onto the donor and thus still have a new, blank drive. But the whole process is unlikely to be worth the effort unless the un-backed-up data on the old drive is very important.

You just can't toilet-train 'em

I I would like you and your great big brain to explain something that has had me bewildered for many many years. Mouse-poo on the mouse pad.

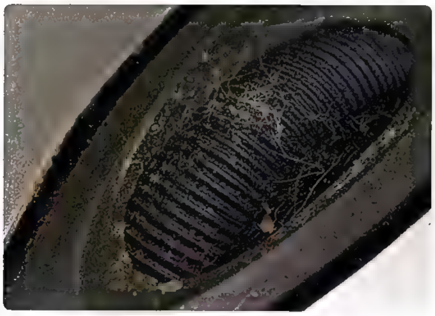
Whatever the surface, it always appears after some time – smooth round blobs of excrement on the mouse pad, and on the 'feet' of my optical mouse. Where do mouses poo from?

I am forever scraping this poo off my mouse pad in a vain attempt to maintain a level of hygiene in the workplace.

Liam McKeon

O The stuff that accumulates on mouse feet, and also in mouse-wheel grooves and the seams of mouse casings, is your very own creation. If you doubt me, take it for DNA profiling.

If you sit in a chair and are careful to avoid moving at all, you may shed as few as 100,000 flakes of dead skin per minute. Usually, humans shed millions per minute. If you're using some tool, like a mouse, shed skin from your hand will combine with sweat and the oily 'sebum' that keeps your skin flexible to make a concoction dubbed 'hand salsa' by FPS gamers. And if you leave hand salsa to dry out



You can really taste the sebum!

it becomes a gooey mass, which accumulates in various places.

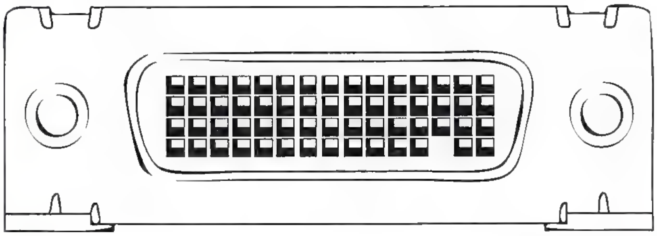
Count yourself lucky that the stuff at least doesn't stop mice from working any more. The rollers of optomechanical mice always used to cake up with delicious little doughnuts of fibre-reinforced hand salsa.

If you want to avoid blobs of crud building up on your mouse-mat, get one with a more pronounced texture. That'll keep the accumulating crud in the valleys between the texture-bumps. Until, of course, you fill the valleys up.

Pins 1 through 5: IBM MDA output

I I've recently got a second PC from an advertising agency that has just gone under. On this PC it has a strange port for a display port, which I thought was a DVI but when I looked closer it's not:

James Mena



Do you know what it is? I would like to buy an adapter for it.

O It's a 'DMS-59' connector.

And yes, you ought to be able to plug standard monitors into it with an adapter cable. There should be two DVI outputs on that one connector, and possibly also two analogue VGA outputs, but I'm not certain. Most DMS-59 adapters (which shouldn't cost more than about $20) are Y-shaped, with two DVI or two VGA connectors, but the analogue video obviously won't work if the card doesn't actually connect those pins to anything.

Try a few hundred write-protected C64 tapes!

I As a computer tech, I carry the obligatory folder-full-o-CD-Rs for when some computer needs application of a specialised utility to set it right – or just when I don't feel like downloading all of it all over again. The trouble is that every so often I come across a computer whose CD drive is broken, flaky, or just never existed. However, they all have USB ports, so I've got a USB stick loaded up for them. My question is twofold:

A: How much should I worry about nasty virus-like things jumping onto my thumb drive when I plug it in? and

B: Are there any thumb drives you're aware of with a write-protection feature to prevent that absolutely?

Ben Yee

O The bulky solution to this problem is an external CD/DVD drive. That'll need an external power brick, though, so it's hardly elegant.

I don't think it's very likely that your USB drive will be infected with anything, but it's certainly possible. If your own computers don't have auto-run stuff turned on then you needn't worry about anything spreading to your systems, but Joe Average's computer has autorun turned on for every possible drive, and there certainly is malware that takes advantage of that. I don't think this is a common feature, though.

There are flash drives with write-protect as standard, but I think many of them do it with some cockamamie software utility. I haven't really looked into this since a 16MB drive cost sixty bucks, though (**http://www.dansdata.com/flashcomp.htm**), so there's probably some good option out there with a proper hardware switch.

Personally, though, I'd do this a different way. Just get an SD card and a slimline reader for it. Cheap, small, and it's got a standardised write-protect system.

I haven't done an exhaustive survey, but I think every SD reader has the little leaf-switch arrangement up the side of the slot that senses the tiny sliding write-protect tab on the cards. I've got a few different MicroSD-to-full-SD adapters here, too, and they've all got the tab, which makes them properly unwritable in two different readers I've tried. MicroSD cards themselves don't have the tab, though; you have to adapt them up to full-SD size.

As with floppy disks in days of yore, the SD write protect system works by mechanical engagement of a physical switch. So it's probably quite easy to open up an SD-card reader and modify it with a bit of tape or glue to regard all cards as write-protected, or as write-enabled for that matter.

Or just Dremel the heads off

I I was trying to find out how to take apart a seemingly impenetrable hard disk drive to remove the magnets and came upon your (very long) discourse on magnets, the universe and everything at **dansdata.com/magnets.htm**. Though almost none of it was comprehensible to me (my fault, not yours) I found myself reading to the end because your style was interesting.

I still can't get into the drive, though!

Jackie Ryan

O As I mention at some point in that lengthy piece, you'll probably need a set of 'Torx' or 'star' screwdrivers; many hard drives (and some other things, like mobile phones) are held together with star screws. You can use hex 'allen keys' in a pinch to remove these screws, but proper Torx drivers work better.

Because hard drives don't have any screws at the bottom of narrow casing holes, you can use cheap quarter-inch hex bits instead of one-piece drivers. But the screws may be too small for any hex bits you can easily buy.

(The big hundred-piece bit set in the picture is a $19.95 Jaycar product, catalogue number TD2038.)

Note that some drives are held together by things other than screws. In the magnets piece, I mention one that was basically just sticky-taped together, with aluminium tape around the seam.

It's definitely worth the effort to get in there, though. Even if you don't care about the lovely precision fasteners and bearings and brushless motor, there are still the pretty platters, the amazingly precise head assembly, and of course the magnets.

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All out of gum...

Ashton Mills gets misty eyed for the good old days of gaming.

I just have to give homage to Duke. Not only for its unfortunate demise as the longest running vaporware that lived up to its title, so well in fact that it *never* eventuated, but also simply because I loved the Duke games and what they bought the industry (read: *humour*). Duke 3D was, by leagues, a brilliant game because it so seamlessly merged FPS with hilarious fun the likes of which was just absent from DOOM, forebear of the 3D revolution as it was. Combined with questionable exploitation of virtual women, some countries tried to ban it back at its release in 1996. Today, it'd probably wouldn't make the shelves anywhere in our button-down society.

... something which changed the landscape of gaming and is an underpin of the software economy online: shareware.

And while Id went on to bigger and better things from DOOM, it's easy to forget that 3D Realms and before it, Apogee, played a vital part in creating the industry we have today.

For one, Id might not have got the start that it did – its first games, Commander Keen and Wolfenstein 3D, where published through Apogee. And this was the case because of something else the company popularised apart from the Duke franchise, something which changed the landscape of gaming and is an underpin of the software economy online: shareware.

Thanks to Apogee we got to play the first chapter of fully fledged games completely free – no time limits, date limits, or anything of the sort. You got a great, full, game for free. But if you liked it (and invariably you did, after tasting it) the next chapters would have to be bought. And why not? You just got the first part for free, a grand gesture in itself.

It was a great model, and it helped launch Wolfenstein for Id, which gave it the kick for DOOM and in turn encouraged the company to self-publish, and the rest is history. We've almost come full circle now, with the 'all new' Wolfenstein about to hit our shores, 18 years later. That's a veritable eon in computing, and a long time coming.

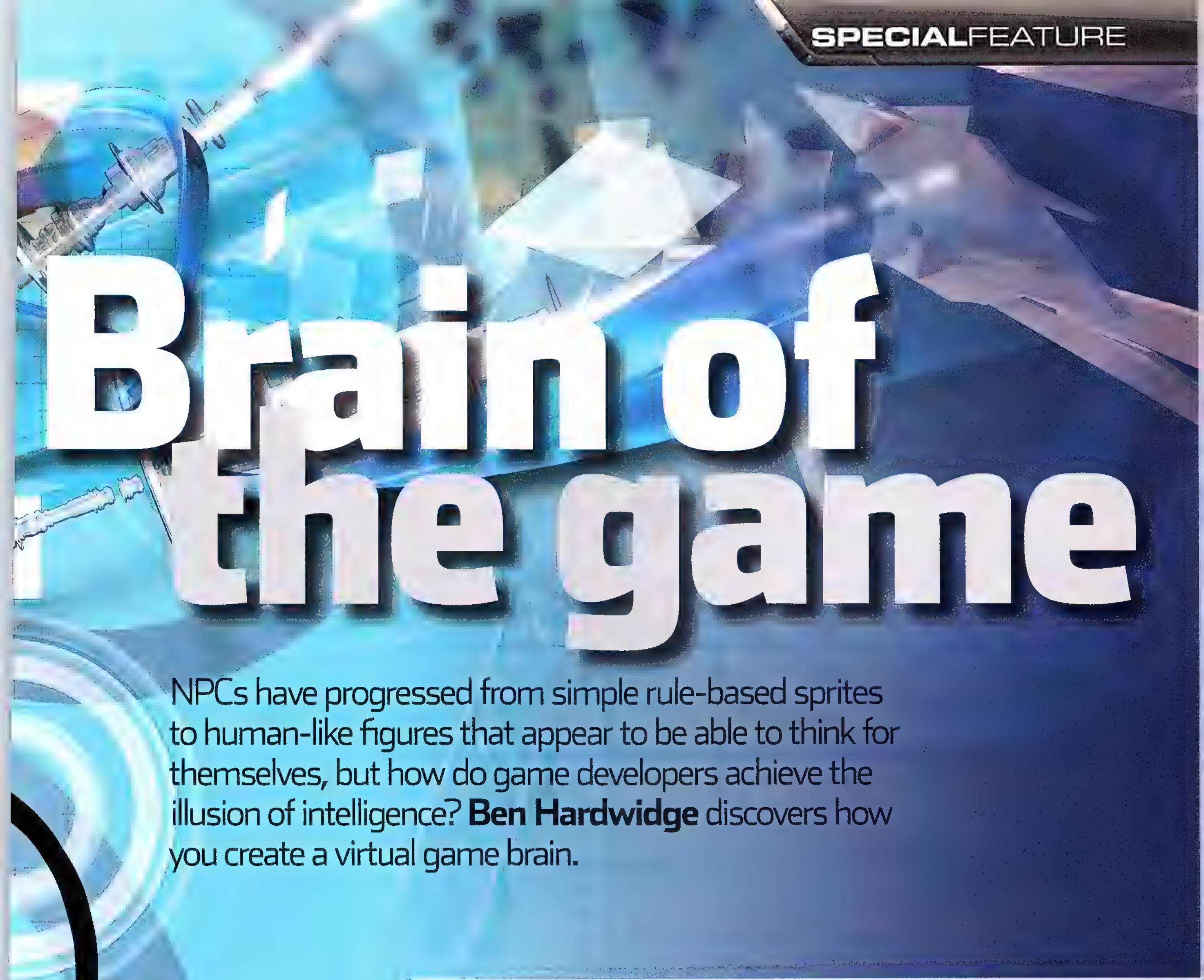
3D Realms was also responsible for publishing a raft of games every gamer knew back then, from the Commander Keen inspired Cosmo to Death Rally, Duke Nukem I to III, and the brilliant Rise of the Triad (RotT). Icons from these games would invariably find themselves in other games, like the amiable dopefish, which found its way into RotT, Duke 3D, Quake, Jazz Jackrabbit 2, Descent, Max Payne and even Daikatana. Clearly, it was the highlight of the game there.

Aside from Duke 3D, RotT was probably the other defining title for 3D Realms, and gave us deathmatch with friends where you could kill them with the randomly weaving Drunk Missiles, or just turn them into chickens. It also gave us one of the first experiences of pseudo-3D levels with a vertical plane – remembering that back then FPS games were all 3D visuals of a 2D level, no level-over-level environments – in addition to breakable glass, bullet holes, dynamic lightning, parallax skies and fog, all features that would later make it into next-gen engines of the day.

The farewell of Duke Nukem Forever brings back all these memories and more (IPX networking anyone?) and it is sad to not only see the game not make the light of day, but to see 3D Realms go under as well. If every generation stands on the shoulders of the last, then we all should tip our hat to 3D Realms for what it's helped give us today. And if you're game, head to **www.eduke32.com** to grab the still currently maintained modernised version of the game based on 3D Realm's source code and updated for modern hardware, including OpenGL and high-res texture packs.

And in case you're wondering, yes the Dopefish still lives!

Yes, Ashton Mills has no gum.
He has, no gum, tonight.
amills@atomicmpc.com.au



Brain of the game

NPCs have progressed from simple rule-based sprites to human-like figures that appear to be able to think for themselves, but how do game developers achieve the illusion of intelligence? **Ben Hardwidge** discovers how you create a virtual game brain.

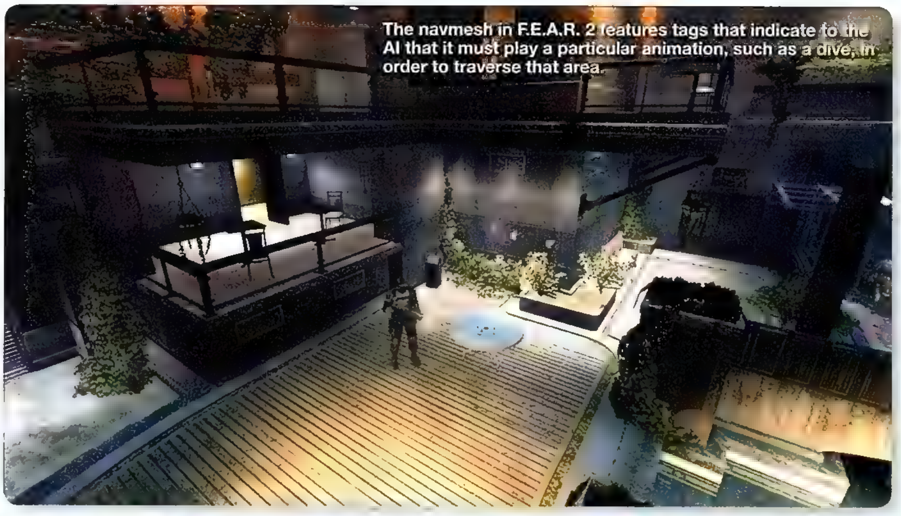
You probably don't think that the average rabbit is particularly intelligent. They generally like eating grass, hopping around, gnawing holes in AV cables and digging holes. How complicated could such a small animal be? Well, in early 2008, IBM embarked on a project to digitally simulate the cerebral cortex of such a small mammal at the Thomas J Watson Research Center.

The test used 8,192 processors and 2.8TB of memory on the Blue Gene-L supercomputer to simulate the 22 million neurons and 11 billon synapses found in a typical rabbit's 16cm brain. Simulating even primitive intelligence is extremely demanding (as our recent and more general article on AI explained), so how does a basic PC go about simulating human intelligence in multiple game characters at once?

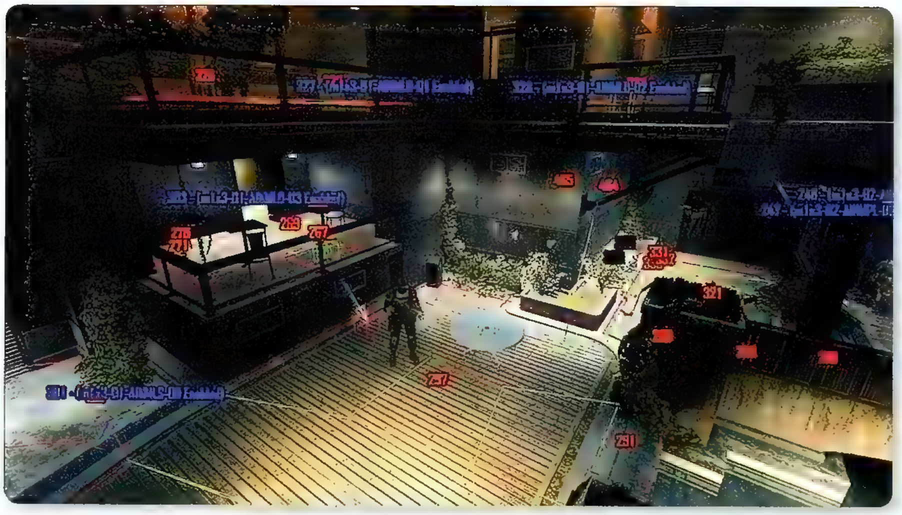
The truth is that gaming AI is in many ways similar to 3D graphics rasterisation, which uses complex trickery such as shaders and textures to give the impression of real light and shadow. If you were to properly ray trace a 3D scene in a game, as you would in a CGI movie, it would take considerably more processing power, and the same applies to AI.

Creative Assembly's AI programmer, Richard Bull, who masterminded the battle AI system in the recent Hot Award winner Empire: Total War explains that "the AI academics are your wizards and we're your stage magicians – it's all smoke and mirrors with game AI. We're trying to give you the perception of reality, and often we therefore look like we've got systems that are much more impressive than anything the academics can create, and we're not doing anything more intelligent. In fact, in most cases, we're not – what we're doing is giving the perception of the AI being much cleverer than it actually is".

When an enemy in F.E.A.R. kicks you when you get close and then dives through an open window, it gives you the impression that it's a real human character wanting to kill you and survive, but all it's really doing is responding to a computer program and using the right animations at the right time. Unwrapping gaming AI is rather like watching the camera zoom out to reveal Frank Oz controlling Miss Piggy; it's disappointing at first, but becomes incredible when you see the amount of work that goes into the puppetry.



The navmesh in F.E.A.R. 2 features tags that indicate to the AI that it must play a particular animation, such as a dive, in order to traverse that area.



United states

So how does a gaming character give the impression of being intelligent? To answer that requires a little grounding in the basics of AI. Let's start with the traditional first-person shooter enemies of yore, which idly patrol their area until they notice you and then start shooting at you. The decisions of these characters are made using state machines.

Each non-player character, or squad of non-player characters, has a number of states, such as 'man shooting' or 'seeking enemy,' and each of these states has various actions and behaviours associated with it. For example, a character in a 'man shooting' state has actions such as firing and reloading weapons, and the character would then change to another state if a certain number of criteria were met. If the enemy moved out of sight, the character might change to a 'seeking enemy' state and employ a set of actions that involve looking around the game world for new enemies.

This concept is simple enough, but the decision trees that make up state machines become massively more complicated as you make characters more intelligent. These decision trees feature a hierarchy of behaviours, and are therefore called hierarchical finite state machines (HFSMs).

Like a family tree, this starts with a single state (such as charge), which can then branch out to a behaviour (such as engage or retreat). Each of these behaviours will then have a number of sub-options (such as flee or guard), which can also branch out into even more actions. The sub-options will compete with each other for execution, and the winner will be decided by the parent behaviour, which makes its decision based on the sub-option's weighting and relevance to the current situation.

Chris Jurney, a senior programmer for Relic, offered the example of the state machines in its RTS, Dawn of War II, to illustrate this. "The AI for Dawn of War II has roughly three main layers: the computer player, the squad and the entity," says Jurney. "The squad and the entities are both hierarchal finite state machines, and we have roughly 20 states at the squad level and 20 at the entity level. The states at the squad level pretty much map directly to orders that can be issued by the user."

"For example, if you issue a capture order to a squad, the squad will enter the SquadStateCapture state," continues Jurney. "This state might find that it's not close enough yet to capture the point, so it will sub-state to SquadStateMove. In this state, the formation movement system will kick in and start issuing Move orders to individual entities, and the entities receive these commands and enter the StateMove state. Inside that, paths are found, dynamics are applied and generally, the individuals try to look smart as they perform their orders."

Some states will also be shared among multiple character types when relevant, and most characters spend most of their time using just a few standard states, with the others waiting in the wings for extraordinary circumstances. Crytek's Matthew Jack provides the example of the famous Korean soldiers in Crysis, which he says have around 25 states from which to choose, but their "core behaviour is defined by only a small number of these". Jack estimates that "perhaps 90 per cent of their time is spent in only five states", while the other states "handle specific circumstances such as using or reacting to vehicles, using special weapons and so on".

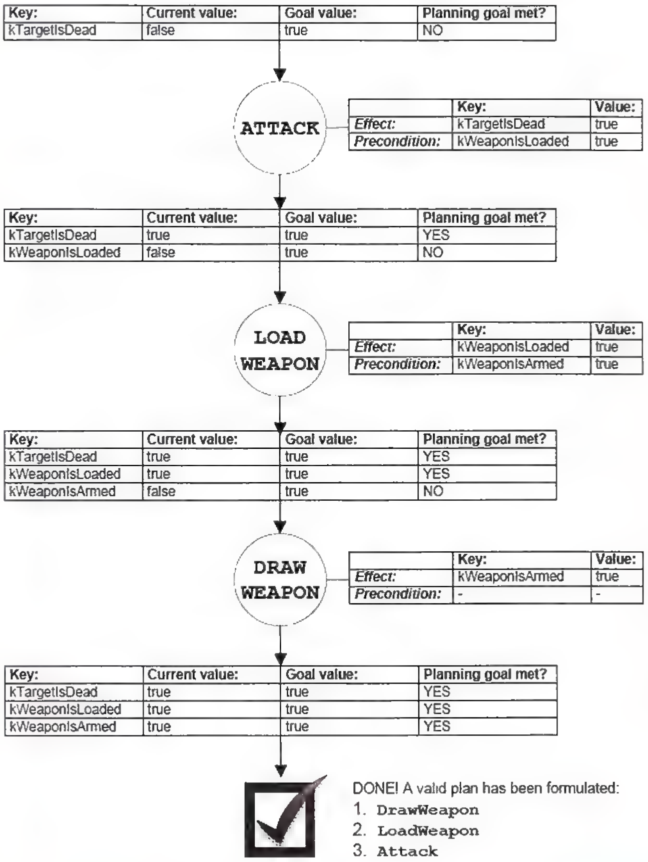
State machines have been the staple core of gaming AI for decades, but they can only go so far before they get out of hand. A non-player character can have scripted or partly random behaviour, but using a state machine will always mean that it's inherently predictable to a certain degree. If you want to make a character appear more sophisticated, you need to make its state machines increasingly bigger – until the point where they become unmanageable.

Creative Assembly's studio communications manager, Kieran Brigden, explains, "When you start talking about an ever expanding number of states then you start to run into problems. For example, if you have a huge number of states for a soldier in Empire: Total War, and then you put 160 men in a unit, and 20 units in an army; think how many decision trees you're having to do for every single soldier on the screen. We're talking about several thousands of guys on the screen at one time; each of those has a massive state-based logic tree, so never mind your two per cent processor overhead."

Crytek's Matthew Jack concurs, saying that "the problem with state machines is defining all the transitions between them; 25 states isn't such a big number for an AI character, but it can be hard for a developer to manage all the ways that a state might be reached, and ensure that it can be reached where it's needed". Without revealing any specifics, Jack also adds that "since Crysis, we've moved towards other behaviour models to help us manage that complexity".

The planning system

So is there an alternative to using state machines in gaming AI? Not entirely – state machines are still required to define simple behaviours in gaming characters, and they're



Key:	Current value:	Goal value:	Planning goal met?
kTargetIsDead	false	true	NO

	Key:	Value:
Effect:	kTargetIsDead	true
Precondition:	kWeaponIsLoaded	true

Key:	Current value:	Goal value:	Planning goal met?
kTargetIsDead	true	true	YES
kWeaponIsLoaded	false	true	NO

	Key:	Value:
Effect:	kWeaponIsLoaded	true
Precondition:	kWeaponIsArmed	true

Key:	Current value:	Goal value:	Planning goal met?
kTargetIsDead	true	true	YES
kWeaponIsLoaded	true	true	YES
kWeaponIsArmed	false	true	NO

	Key:	Value:
Effect:	kWeaponIsArmed	true
Precondition:	-	-

Key:	Current value:	Goal value:	Planning goal met?
kTargetIsDead	true	true	YES
kWeaponIsLoaded	true	true	YES
kWeaponIsArmed	true	true	YES

DONE! A valid plan has been formulated:

1. `DrawWeapon`
2. `LoadWeapon`
3. `Attack`

This diagram by Jeff Orkin from the MIT Media Lab, who also worked as a senior software engineer on F.E.A.R., shows how an AI character forms a plan using a goal-orientated planning system.

perfect for this job, so there's no need to change them. Creative Assembly, for example, still uses a state machine for 'man shooting', among many other states. The problem is when you want to make your characters act more intelligently without cluttering up your CPU resources and creating huge, complicated workloads for programmers. The answer to this is a relatively recent development in gaming AI called the goal-orientated planning system.

Monolith's F.E.A.R. was one of the first games to bring planning systems to the fore at the end of 2005, and it was instantly noticeable when you saw multiple characters on screen acting uniquely and in some cases, very humanly. Gone was the straightforward shooting and wandering around, and in came an advanced force of enemies that would vault over obstacles, duck to avoid explosions and kick you during close combat.

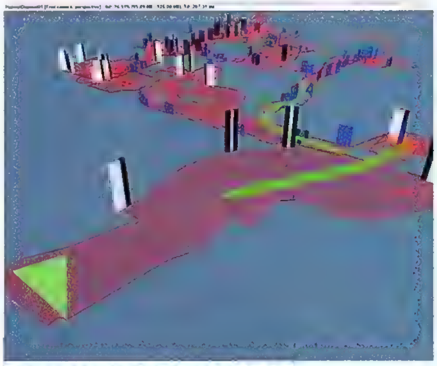
In simple terms, a planning system makes a gaming character work out what it has to do in order to fulfil an objective. Instead of having a series of rule-based behaviours in a state machine jostling for attention, it will have a set of goals or objectives, and the character has several choices of ways to achieve them, which depend on the current circumstances. In Empire: Total War, typical goals would be 'make sure my flanks are secure' or 'look after this fort efficiently', which are always prioritised according to the situation. In order to achieve a goal, the computer needs to look at the situation in which it wants to be, and then work backwards from it to calculate the best way of achieving the desired result.

Creative Assembly introduced its own planning system in Empire: Total War, which could make the AI much more unpredictable compared with previous Total War games. Richard Bull worked on the battle AI in the game, and describes a planning system as "like a state machine that re-writes itself", but adds that "it isn't a magic system in that it isn't capable of creating its own objectives or tasks; we have a repository of things that the AI can do, and a repository of things that the AI might want to do".

When using a planning system, the AI works on a per-goal basis, working out which goal to prioritise after analysing the situation. In Empire: Total War, Bull gives the example of the AI "rolling its line infantry with cavalry on its flanks and with artillery on its wide flanks

The Abominations in F.E.A.R. 2 can jump down from the ceiling and climb walls thanks to Monolith's system of segments.

If you kill one of these mutants in Fallout 3, the other won't think twice about picking up his dead brother's weapon if that's the most efficient way of achieving his current goal.



By representing buildings and objects as simple squares on the navmap, the AI in Fallout 3 can react quickly to a dynamically changing environment.

waiting to get within range". Bull explains, "It would then be dangerous for the planning system to say 'well actually, I want to use these guys to do this job over here' at the risk of damaging the whole army plan, so the AI takes the resources into account, as well as their current activity and state of action, plus the enemy threat and the terrain."

Bethesda also moved over to a planning system for the combat AI in Fallout 3. Jean-Sylvere Simonet, a programmer at Bethesda who worked on the AI in the game, explains that it "combines simple actions (small state-machines) into entire plans. We implemented a planner for this after trying out other alternatives. In the end, an NPC in combat was able to prioritise goals and actions to maximise their chance of success".

The end result in Fallout 3 is that an NPC works out the most efficient way of achieving its goals, which makes it appear as though it's thinking for itself. It's impressive stuff to watch. For example, if there are two Super Mutants in front of you, you kill one of them, and the other one then runs out of ammo. The remaining Super Mutant will then have the goal of finding a new weapon, so the planning system will work out the most efficient route of obtaining one; if the nearest weapon happens to be on his dead brother's body, he'll pick it up. This level of unpredictable behaviour would be very complicated in a state machine, but a planning system means that the NPC does it automatically.

Planning systems aren't the answer for everyone though. Relic, for example, still uses state machines for the AI in Dawn of War II, since the developer wanted the AI to be predictable to a certain degree. Chris Jurney points out that when a player issues an order to a squad, "he then expects that unit to carry it out to the best of his abilities. Because of this, it's very important that units perform consistently so that users can build an expectation of what will happen when they click".

"As a result," says Jurney, "for the purposes of AI, this means that predictability trumps smarts, so things like learning or re-writing decision trees are out. The expectation of getting the exact most optimal behaviour is a lot higher in RTS games as well, because the player can see every action of every entity he's controlling and fighting against."

... an NPC works out the most efficient way of achieving its goals, which makes it appear as though it's thinking for itself.

All terrain thinking

So you now have characters that look like they can think for themselves, but how do they know where they are, and how do they know what their environment looks like so that they can reach you in the most efficient way? NPCs can't see the same game world you're viewing – that would take a ridiculous amount of processing power. Instead, they need a guide to the areas to which they can go. This often takes the form of a navigation grid that shows obstacles and the shape of the terrain, but developers often also use a navigation mesh (usually called a navmesh) that's local to the current 3D scene.

A navmesh is basically a low-resolution 3D mesh that sits on top of a 3D scene and shows an AI character the areas to which they can move, as well as featuring tags and hints to the AI that have been placed by the designer. On the AI development blog for F.E.A.R. 2: Project Origin, Monolith's senior software engineer, Matt Rice, explains that "the designer will place this invisible mesh any place he wants the AI

CAN AI BE HARDWARE-ACCELERATED?

There aren't many gaming features that don't have a hardware accelerator of some description these days. A GPU can accelerate both 3D graphics and physics, while a decent sound card can accelerate advanced surround-sound effects. As AI is such a fundamental part of gameplay, shouldn't we be accelerating that with hardware too?

In 2005, an Israeli company called AIseek (www.aiseek.com) announced a dedicated AI processor called the Intia, which was designed to accelerate some AI features, including terrain analysis and path finding. However, several years later we've yet to see any products based on the technology. The problem with this sort of dedicated hardware, of course, is that AI is such a fundamental part of gameplay that it can't be optional. As such, an AI processor would need to be a part of a standard PC.

This is what makes AI ripe for the picking when it comes to GPGPU technology. Almost every PC gamer has a graphics card of some description and, providing it's compatible with Nvidia's CUDA or AMD's Stream technology (or a cross-platform GPU API such as OpenCL), it could be used to take some of the load from the CPU when it comes to repetitive AI processing.

AMD's head of developer relations, Richard Huddy, explains that the most common AI tasks involve visibility queries and path finding queries. "Our recent research into AI suggests that it isn't uncommon for gaming AI to spend more than 90 per cent of its time resolving these two simple questions," says Huddy. He then adds that these two queries are "almost perfect for GPU implementation", since they "make excellent use of the GPU's inherently parallel architecture and typically, aren't memory-bound".

Nvidia agrees. Director of product management for PhysX, Nadeem Mohammad, explained that "all the simple, complex operations" involved with path finding and collision detection "are all very repetitive, so path finding is one of the algorithms that works very well on CUDA".

Interestingly, Mohammad also adds that ray tracing via CUDA could play a useful part in AI when it comes to visibility queries. We aren't talking about graphical ray tracing, but tracing a ray from a bot in order to work out what it can see. "You have to shoot rays from point A to point B to see if they hit anything," says Mohammad. "We do that exact same calibration in PhysX for operations such as collision detection."

"You can always imagine CUDA as loads of processors running the same program but not the same instruction, and ideally on the same data set but with different input parameters," says Mohammad. "So, in the context of AI, the data set consists of the whole game world, and the parameters going into it are the individual bots – that's one way of neatly parallelising the problem. If you look at it in that context then any AI program could be accelerated."

It doesn't look as though we'll be waiting for long before we see GPGPU-accelerated AI either. Both AMD and Nvidia claim to be working with several game developers and middleware developers in AI at the moment, although no names have been revealed yet. According to Huddy, "some middleware providers are looking at this in terms of packaging up a GPU AI library for games, while some developers are looking to transfer their own existing AI code from CPU to GPU".

"The folks doing this aren't quite ready yet," says Mohammad, but adds that they will be quite soon. Mohammad estimates that we'll see GPGPU-accelerated AI as soon as a year from now. "I don't expect it before 12 months," he says, "but I would definitely expect it within 18 months."

The idea of GPGPU-accelerated AI also appeals to game developers, who are constantly on the lookout for ways to make their systems intelligent without using up valuable CPU resources. "I think there's a lot of potential for GPU acceleration to benefit AI," says Chris Jurney, Relic's senior programmer on Dawn of War II. "All our AI is grid-based, and we're already using rasterisation to keep our maps up to date, and for line-draws on those maps to test for passability, so it's a great match."

Crytek's Markus Mohr is also supportive of the idea of GPGPU-accelerated AI, saying that "with the arrival of widely available parallel architectures, we have the opportunity to achieve new levels of quality and quantity". Mohr also notes that it "doesn't makes much sense to develop dedicated hardware for AI," such as the Intia chip.

Creative Assembly's Richard Bull agrees that "any hardware advances that can offer up processing power will allow us to think of more things that we can possibly do, certainly for planning or prediction". However, he also points out that the battle AI in Empire: Total War "peaks at about 2 per cent of the logic usage".

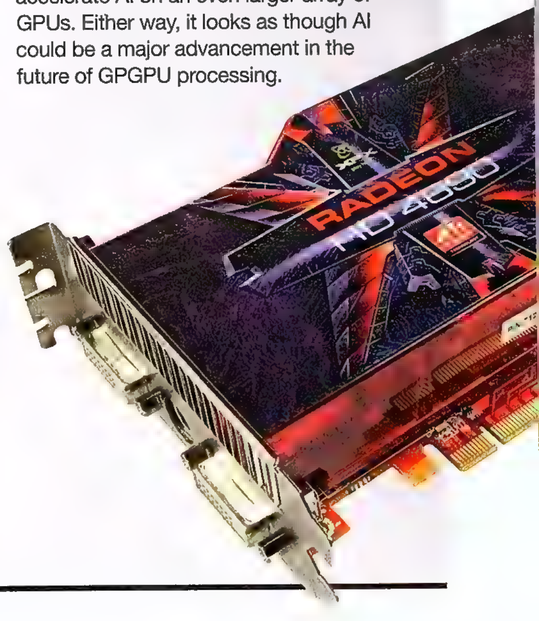
This doesn't mean that AI isn't in need of advanced processing power; it just means that AI in its current form has limited resources available to it, and it always has to compete with graphics for even a small share of processing power. Bull offers the example of an unbeatable chess computer that "gets to an end state by working out every possible move for every possible piece. A chess problem like that can, literally even now, with a lot of processors take hours, weeks or months to work out an optimal solution for". Basically, there's always room for more processing power for AI.

"What runs slowly on the CPU, maybe taking 25 per cent of the CPU load, can run very efficiently on the GPU, adding only one or two per cent to the total GPU load," Richard Huddy points out. Even a small share of a GPU's resources could provide a boost in AI processing power for some tasks, and it looks as though GPU companies and game developers are keen to see this working soon.

Not everyone is convinced that GPGPU is the best way of processing AI though. Bethesda's Jean-Sylvere Simonet notes that "we might be able to take advantage of parallel architectures, but not for everything. You could probably speed up some individual parts of the decision process, such as replacing your AI search with a brute-force GPU approach, or running a pattern detection algorithm". However, Simonet also points out that "most AI processing is still very sequential and usually requires a lot of data. For an NPC to decide on its next action, it will usually have to query the world for a tonne of information, and most of that information is conditional on a previous query result. For that reason, fewer processors that are more versatile, such as the SPEs in the PlayStation 3's Cell chip, are ideal".

It's also worth noting that both AMD and Nvidia are talking about utilising this in CUDA and Stream at the moment, which would make it hard for GPGPU-accelerated AI to become a standard in the gaming industry. "We rely on the fact that all CPUs in all PCs come up with the exact same result to make multiplayer work," points out Relic's Chris Jurney. "We're only transmitting the inputs and commands between players, so if two GPUs decide on slightly different results in the AI, different players will be playing in different worlds."

Perhaps OpenCL or DirectX 11's Compute Shader could provide a way to accelerate AI on an even larger array of GPUs. Either way, it looks as though AI could be a major advancement in the future of GPGPU processing.



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Relic's system of rasterising terrain maps on the fly allows the AI to react quickly to changes in the environment.

character to potentially move to".

Rice provides the example of an NPC in the game deftly manoeuvring between objects that provide cover, and then diving through an open window to flank a buddy who's taking fire. Rice explains that "this is accomplished by our fancy animators creating a palette of animations for the designers to use in any given space. The designer will then tag a portion of the navmesh to indicate to the AI that he must play a particular animation (a dive for instance) in order to traverse that area".

This might sound a lot like scripting, but the NPC will decide for itself whether diving through the window is the best course of action by using the game's planning system. If he needs to dive through a window, then the navmesh will tell him which animation he needs to use when doing it. Amusingly, Rice adds that "if the resulting path ends up by looking cinematic and awesome, then sweet; I'll take credit for it. If not, it's back to the drawing board for myself and the designer or animator, or both."

A navmesh provides more flexibility than a standard navigation grid, and not just because of the animation hints. Bethesda's Jean-Sylvere Simonet points out that the navmesh used in Fallout 3 for local path finding "turned out to be the perfect support for storing cover information that the NPCs needed, and it also allowed us to have a unified pipeline for making small and large creature paths around the environment. Whereas our previous system (a navigation grid) assumed a standard character size, the navmesh let both Bloatflies and Behemoths use the same data to find their way around corridors and alleyways".

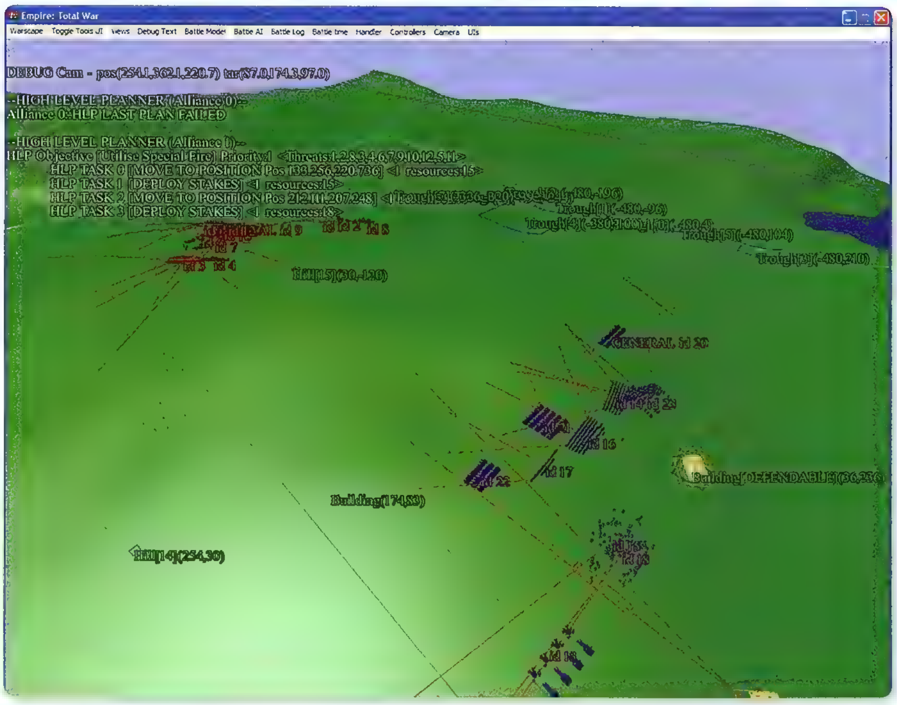
Simonet also points out that a navmesh can help the AI with much more than path finding. "Because of the inherent spatial information it stores," says Simonet, "we were able to write algorithms that 'thought' about the space. Searching behaviour, for instance, was able to use the navmesh data to map out areas that an NPC had investigated quickly and efficiently, and it could then come to a conclusion about where the target was."

In a similar fashion, the terrain analysis in Crysis was managed by first triangulating the terrain; the AI can then derive a path-finding grid from the triangulation. Crytek's Pavel Mores explains that this grid "was unified in the sense that multiple kinds of agents could use it. This was achieved by storing additional data with nodes and links (hints placed by the game designer) to decide, for instance, whether an agent is small enough to pass through a link or whether it can handle the water depth associated with a link".

As well as the terrain triangulation system, Crysis used traditional waypoint graphs (such as an Ordnance Survey map) to define longitude and latitude on the surface, but it also featured what Mores describes as "specialised support for navigation through 3D space". He explains that "one part of this is what we call flight navigation, which is effective for volumes where an up-vector can be reasonably defined

Navigating inside 3D volumes is an AI challenge that's becoming increasingly more important.

With thousands of men on the screen at one time in Empire: Total War, Creative Assembly decided that a planning system would be a more efficient way of creating sophisticated NPCs, rather than using overly complicated state machines.



```
DEBUG Cam - pos(254.1,362.1,220.7) tar(87.0,174.3,97.0)

--HIGH LEVEL PLANNER (Alliance 0)--
Alliance 0:HLP LAST PLAN FAILED

--HIGH LEVEL PLANNER (Alliance 1)--
HLP Objective [Utilise Special Fire] Priority:1  <Threats:1,2,8,3,4,6,7,9,10,12,5,11>
        HLP TASK 0 [MOVE TO POSITION Pos 138.256,220.736] <1  resources:15>
        HLP TASK 1  [DEPLOY STAKES] <1  resources:15>
        HLP TASK 2 [MOVE TO POSITION Pos 212.111,207.248] <1
        HLP TASK 3 [DEPLOY STAKES] <1  resources:18>
```

(where there's gravitation). The other is volume navigation, which supports free movement in space, so it's more general at the cost of more complex pre-processing".

Navigating inside 3D volumes is an AI challenge that's becoming increasingly more important. We aren't only up against foes on the ground anymore; in a game such as F.E.A.R. 2, or even BioShock, we're now up against mutant beasties that can climb walls and traverse ceilings, as well as hanging off ledges and falling through the air. Monolith uses an impressive method of addressing this in F.E.A.R. 2 with the use of what it calls 'segments'.

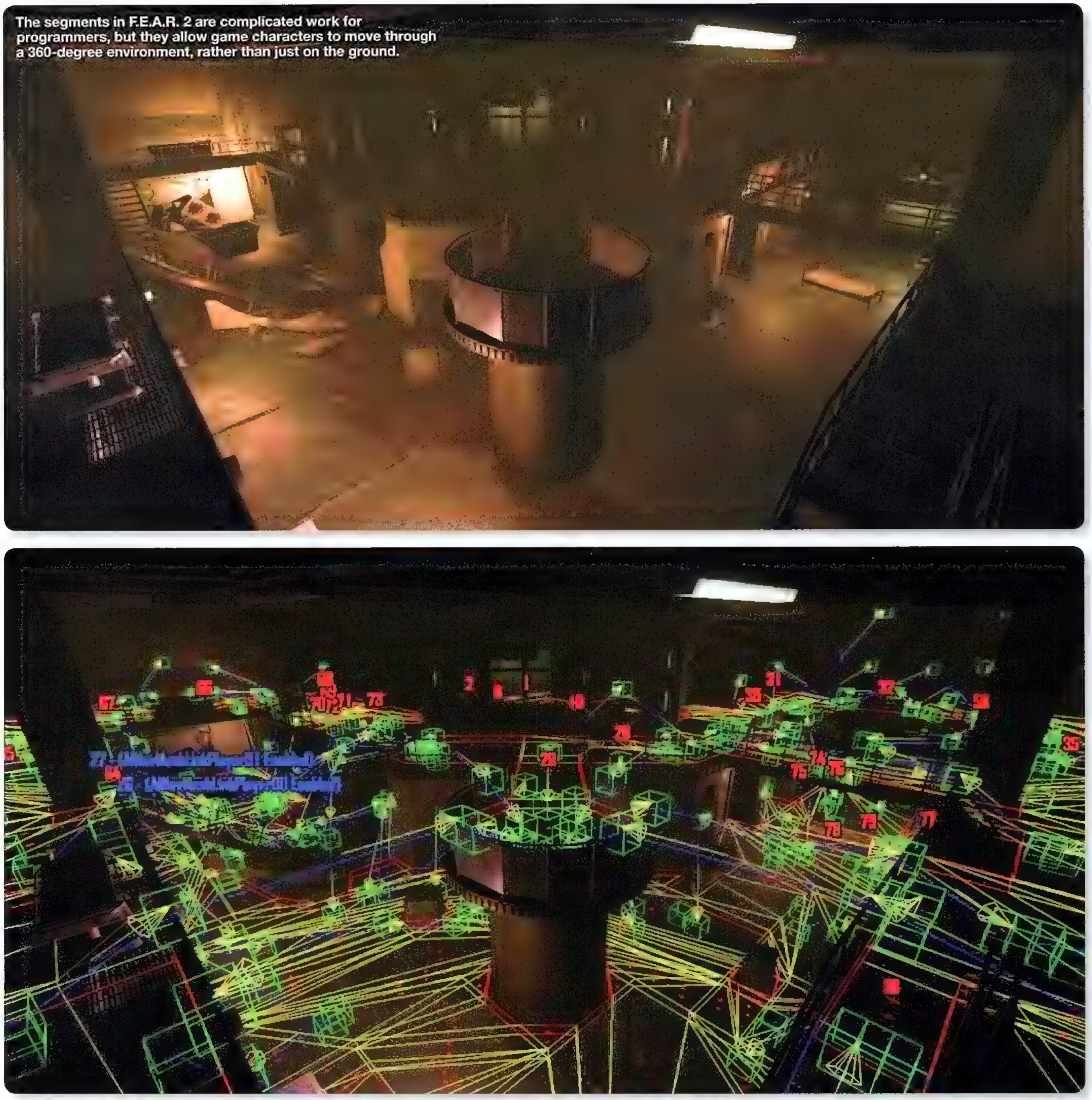
Monolith's Matt Rice explains that "segments are a series of points and links, which may or may not be on or attached to the navmesh. The AI is free to create paths using these segments just as they would on a normal navmesh". However, unlike a polygon in a navmesh, whereby an AI character is allowed to move to any point within that polygon, a segment is placed in a very specific point in the scene, and these points can be located anywhere in the environment. This, says Rice, gives the "AI characters free rein over the environment, no longer tying them to just moving along the floor".

When you combine segments with a planning system, you end up with chaotic scenes in which you can have monsters coming at you from all directions, and in an unpredictable fashion. As an example, Rice says that "while the player is focused on the half-naked Abomination directly in the front, his compatriot will have leapt from the floor to the ceiling directly above, to the wall at the right, and ended up directly behind the player ready to pounce".

Segments are a very complicated feature to implement though. Rice explains that "for the designer, the added complexity of managing all of the segments and links can be daunting". However, he's confident that "anyone who has battled F.E.A.R. 2's Abominations will appreciate the many acetaminophen pills the team consumed".

Meanwhile, Relic uses a large number of one-megapixel navigation grids to store the terrain data for the AI in Dawn of War II. As RTS veterans will know, Company of Heroes introduced the concept of using terrain and objects in the game as various levels of cover, and this continues in Dawn of War II. To do this, the game needs two grids for cover – one for the terrain, and another for objects and obstacles.

In addition, the game features a grid that describes the largest size of unit that can go into each cell, plus a grid that the units can use to reserve their destinations when moving, so they don't end up competing with another unit for the same space. On top of that, there's another



The segments in F.E.A.R. 2 are complicated work for programmers, but they allow game characters to move through a 360-degree environment, rather than just on the ground.

grid that describes where units are going to be located in the near future – again to avoid collisions. There's also a 'hierarchical sector map' that describes where cells with identical properties are merged together, which speeds up long-distance searches. That amounts to a total of six maps needed to transport NPCs from A to B in an intelligent fashion.

Relic draws its maps dynamically using rasterisation, just as you would in the 3D world. Relic's Chris Jurney explains that it's "just like what a graphics card does when it draws triangles to the screen. When you put a new building into the world, we draw the box that it blocks into the various map grids to update them, exactly like rendering a quad (a group of four pixels) in an overhead view".

Destructible environments

An advantage of Relic's system of rasterised designer-hinted maps is that it makes it easy for the game to keep up with changes in the environment. With increasingly complicated physics algorithms, game developers are under pressure to make game worlds react as realistically as possible. One of the hot ideas at the moment is destructible environments, in which you can destroy or damage an object such as a tree or a building, with the result having an effect on the gameplay.

Dawn of War II features destructible battlefields, but Jurney says that this is actually pretty simple. "We keep all the maps and world representations up to date as the world changes due to construction or destruction," he explains. "So as long as the AI makes decisions often enough, they respond instantly to changes. Our AIs analyse their environments continuously (roughly every 0.5 to 1 second), so as soon as the world changes, their behaviour changes to match it."

A game that was particularly notable for its destructible environments was Crysis, in which you could drive a jeep through a jungle and knock down trees in front of you. Crytek's Pavel Mores explains that the developer needed multiple ways of dealing with an environment that could change dynamically and unpredictably. He gives the example of the AI performing a path-finding search on the navigation grid as though there were no dynamic obstacles present, and then retrieving the dynamic obstacles near the resulting path and adjusting it accordingly if there was an intersection.

A rich navmesh can also help out when it comes to destructible environments, and Bethesda used this in Fallout 3. The navmesh can be dynamically updated in the game when large rigid bodies are removed. This, of course, would usually use a fair amount of processing power, but Bethesda got around this by using simple square boxes to represent a rigid body on the mesh.

Bethesda's Jean-Sylvere Simonet says that this works fine though. "In practice," he says, "most dynamic objects have a pretty square outline (cars, buses, tables and so on), so this worked out. The process is to then find out the area of the navmesh that's overlapped by the rigid body and retesselate that area, leaving a hole along the bounding box's outline. Then we have to recompute cover edges on the fly, but that turns out to be quick, since there are only four new edges to check. The result is that NPCs can then use these dynamic objects as cover."

The future

AI is clearly becoming much more important in games, but it still has to compete with pretty graphics when it comes to processing resources, and it's often at the bottom of the pile.

Creative Assembly's Richard Bull notes that "there's still this disturbing mindset among programmers, particularly game programmers, that if the AI is taking any kind of considerable chunk of time, that's a really bad thing. It's only just getting to the stage now where people regard it as important enough to deserve this chunk of time in a game. If your graphics rendering is taking up 50 per cent of your CPU time it's like 'well, never mind, it looks great', but if you try to tell people that you have this really intelligent decision-making system that's taking up 30 per cent of the CPU time, they'll say 'you obviously don't know what you're doing, it's badly programmed' and so on".

However, with GPU hardware support and multithreading becoming more widespread, we'll hopefully see AI using a greater amount of resources. Just take a look at your CPU resources when you're running Fallout 3 or GTA IV, and you'll see that your CPU is being hammered. Anything that can provide game developers with more AI processing power will be warmly welcomed by the gaming industry, and we can then progress to even more sophisticated AI systems.

Where is gaming AI going in the future? Creative Assembly's Richard Bull points out that "once you're past the state machine, you've got the planning system, which is the rewired state machine, then the next step then is online learning". In the same way that online chatbots such as Jabberwacky and Eliza learn as a result of constant online input, an AI system could do the same. In fact, Creative Assembly already has a similar technology in the form of a debugging system that's used in its research and development process.

"We have this system of replays, and we have the ability to push these replays back through our AI debugging system, and we can get information from that," says Bull. "A lot of the advances in our planning system were trained by just running replays through this thing. It's completely offline, but it would be interesting to have some kind of system where we could just get gamers to send their replays in."

> "Then we have to recompute cover edges on the fly, but that turns out to be quick, since there are only four new edges to check."

With a constant online feed of battle results coming in from players using different strategies, the AI could then balance the stats and learn other strategies from human players. Creative Assembly's Kieran Brigden enthusiastically notes that "it's impressive watching the AI go through the debugger – you're basically almost talking about a contained feedback neural network". Bull describes the potential as a "kind of 17th Century Skynet", which could feed off loads of online data and improve considerably.

And don't forget: this is just the beginning of the future.

TRANSFORMING MACHINE INTO BEAST

Throw any high-performance hardware inside the HAF 922 mid tower and transform your machine into a beast. With option for up to three massive 200mm fans, this high air flow designed chassis wastes no time in removing heat build up. The spacious interior works perfectly with Cooler Master's trademark cable management and tool-free installation designs. The intent is clear. Tear apart any game or applications that come your way.

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QLD	Computer Alliance	07 3421 3200	www.computeralliance.com.au
	Game Dude Computers	07 3387 1500	www.gamedude.com.au
	MSY Technology	07 3217 9070	www.msy.com.au
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HARDWARE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

We start off with the latest CPUs from Intel and AMD, and it's turned into a little budget-beasty grudge match in the opening pages of our reviews this month – who's on top?

Then it's straight into the latest motherboards, followed up by tasty graphics cards from Gigabyte, Sapphire and more. There's some cooling love, hard drive affection (of both the plattered and solid variety) and then we get to grips with a unique new gaming system from the building guys at DCA Computers.

Finally, we've got a round up of 24in monitors, and we find the best for your HD video, gaming and desktop needs. It's a corker!

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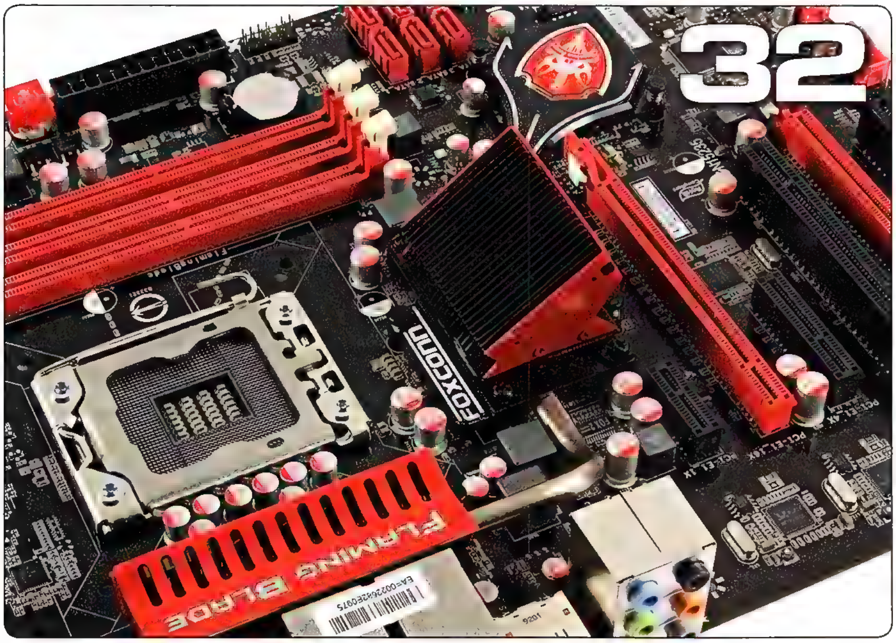

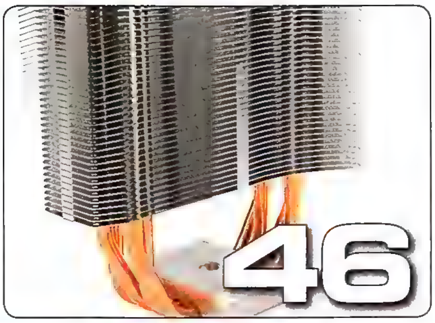

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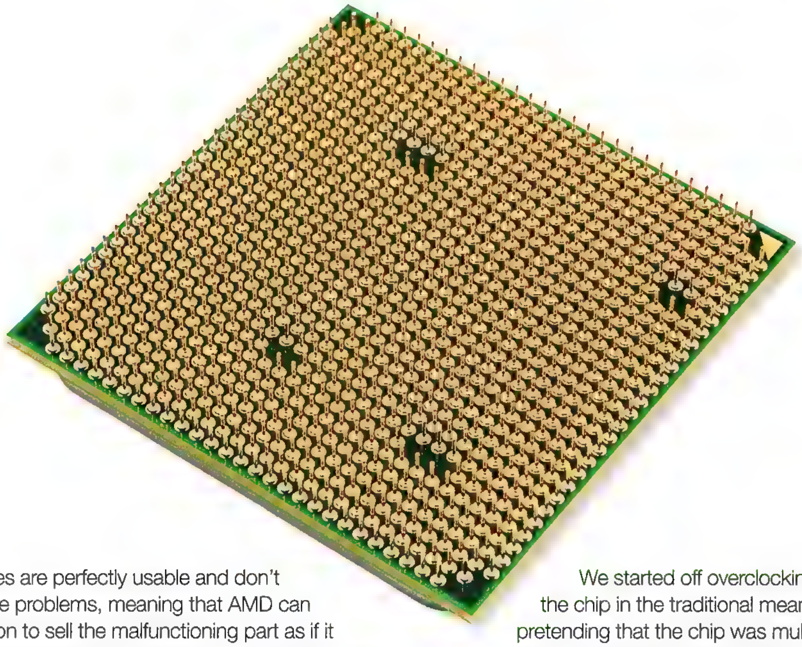
Want to play the new Wolfenstein game at Atomic HQ? Want to enjoy some pizza and a few drinks with your mates, and the Atomic crew?

Then check out www.atomicmpc.com.au/wolfenstein for more details today!

Phenom X2 550 Black Edition 3.1GHz

AMD's budget monster chip.

Street Price $145 **Supplier** AMD
Website www.amd.com
Specifications 3.1GHz dual core; 45nm manufacturing process; 'Callisto' core; 128KB L1, 512KB L2, 6MB L3 cache; 15.5x unlocked multiplier; 80W TDP.



While we'd love to kick off this review by saying this is finally the chip that brings AMD back to the top of the performance heap, sadly, this isn't the case. However, that doesn't mean that all is bad; instead we've got the most impressive CPU we've seen from AMD in quite some time. What makes it impressive compared to other CPUs is down to some deep-seated silicon choices, but as we found they were all good decisions.

Based around the Callisto core this is essentially the quadcore Deneb die that we've seen in most Phenom II chips to date, simply tweaked a little to suit other purposes. It has the same 258mm2 die size, and the same 758 million transistors built around a 45nm manufacturing process, with the same manufacturing technique usually favoured by AMD (see the boxout for more).

Just like the triple-cored CPUs that AMD produce, this chip created via a faulty quadcore that has two cores deactivated. While this might sound bad, in reality the remaining functional cores are perfectly usable and don't have problems, meaning that AMD can go on to sell the malfunctioning part as if it intended them to be created. The X2 550 retains the 64KB instruction and data L1 caches of the Phenom II design, as well as the 512KB L2 cache. Surprisingly it's also treated to a huge amount of L3 cache, nabbing AMD's highest current amount of 6MB between only two cores.

Silicon on Insulator

Also known as SOI, this method of creating a semiconductor uses two layers of silicon with an insulator in-between. The more common method doesn't have this layer (which is usually silicon dioxide, known for its insulative properties), but both methods have their strengths and weaknesses. SOI lowers electron migration and parasitic capacitance in the silicon, leading to lower temperatures and lower power consumption. Intel does not use SOI tech at all.

The Thermal Design Power (TDP) of this chip is only 80W which is much lower than the other Phenom CPUs, thanks in large part to a significant chunk of the chip being disabled. As such when running underneath a TRUE it was very cool even when overclocked. This chip is a Black Edition, which means that the stock 15.5x multiplier can be adjusted up or down in half step increments as you see fit. For overclocking this is a great decision, but even at stock speeds this chip purrs along at 3.1GHz. Performance is actually pretty solid at this level, getting nice scores in singlethreaded apps and decent ones in multithreaded ones, really showing off the scaling from a single to dual core (though this return drops faster as you add cores).

We started off overclocking the chip in the traditional means, pretending that the chip was multi-locked at 15.5x just to see how far it'd get. It could be tweaked up to a 243MHz Hypertransport bus, which gave an effective speed of 3790MHz. This isn't really much to write home about but was easily achievable for those who prefer clocking this way.

A smarter way to use the Black Edition chip is simply to increase the multiplier in half-step increments, adding Vcore as needed to stabilise. We hit 3.8GHz with ease, and managed to get the multi all the way to 20 – hitting a maximum stable speed of 4GHz! This is astounding for such a cheap CPU to hit on air cooling alone, and high clockspeeds should be easily achievable by even the most novice of overclockers. We got a Cine multithreaded score of 8625 at 4GHz, and definitely recommend this chip as a great value overclocking beast. **JR**

Phenom X2 550 Black Edition 3.1GHz

X2550	200x15.5; DDR3-1333 7-7-7-21	217x15.5; DDR3-1446 7-7-7-21	230x15.5; DDR3-1532 7-7-7-21
PiFast	35.48s	32.49s	30.72s
wPrime 32M – single thread	46.219s	43.428s	40.357s
wPrime 32M – multi-thread	23.216s (1.99x efficiency)	21.822s (1.99x)	20.433s (1.98x)
CineBench R10 64-bit – single thread	3599	3864	4154
CineBench R10 64-bit – multi-thread	6948 (1.93x efficiency)	7578 (1.96x)	8003 (1.93x)
Everest Read	8324MB/s	8820MB/s	9350MB/s
Everest Write	6682MB/s	7240MB/s	7674MB/s
Everest Latency	53.2ns	50.5ns	47.5ns

Performance 80
Only dual core, but scales very well.

Overclockability 92
Broke the 4GHz barrier on air!

Value 86
Incredibly cheap for a Black Edition.

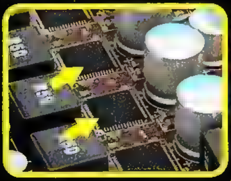
Overall
It's great value, and even better fun.
87%

MSI X58 Pro-E

Superior Quality and Amazingly Affordable

Unique Power Saving Technology - DrMOS and APS

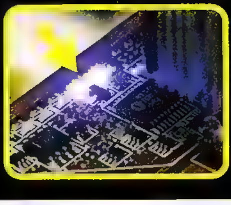
What also worth to be mentioned are MSI's unique DrMOS and APS (Auto Phase Switching) technologies. MSI's unique DrMOS chip controls the Driver IC, Top and Bottom MOSFET, and other components to constantly deliver the optimum power level required. The result is it conserves power, without sacrificing the ability to overclock. The low impedance and agile response time further ensure a high performance-to-power ratio, and MSI's APS technology ensures solid supply by allowing the user to select the power supply type. Coupled with the DrMOS solution, these two unique functions give our customers power-saving functionality, while maintaining strong spec support and performance.



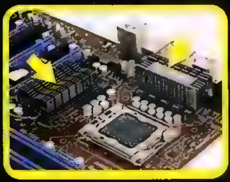
2nd-Generation DrMOS chip makes MSI X58 Pro-E carry amazing performance as overclocking and power -saving simultaneously.

The design of solid capacitors and shielded chokes expands the lifespan and improves the stability.

Enhanced mechanism - Thermal System now are fixed by screws which let thermal parts provide better efficiency than pushpins.

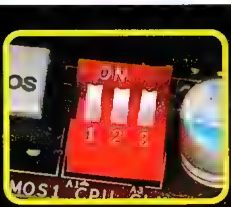


APS technology adjusts power usage efficiently and flexibly than ever.



Split Thermal System combined with performance and artistic layout.

Maximum Performance per buck–MSI X58 Pro-E



Easy OC Switch can provide quick and easy solution.

The MSI X58 Pro-E is a feature-rich mainboard refined upon Eclipse series. MSI X58 Pro-E is offering cutting edge innovations at an attractive prize for both overclockers and normal users: There is Easy OC switch which makes overclocking more convenient and quick than ever. Moreover, X58Pro-E, which provides up to 3 graphics card slots, supports 3-way SLI and CrossFireX, giving you a perfect output solution. With top quality features and fair prize, X58 Pro-E must be your best choice.

World's first affordable X58 mainboard with True Blu-ray Audio support

True Blu-ray Audio

MSI takes the lead in using a HD audio chip with its respective Blu-ray DRM compatible driver/software, which provides the best audio output of 24-bit /192 kHz. Compared to other mainboard which has no corresponding True Blu-ray Audio chip built-in, the latter one's audio output quality drops to lossy 16-bit/48kHz.

Additionally, in order to tune the signal-to-noise ratio (SNR) to reach the industry's standard, MSI also adopts the best quality ADC/DAC component. This guarantees a lossless audio enjoyment resembling the true-world sound when the digital signal is transferred for analog playback.

http://www.msicomputer.com.au

Intel Q8400 2.66GHz

Intel hits back with its own budget chip.

Street Price $260 **Supplier** Intel
Website www.intel.com
Specifications 2.66GHz quad core; 45nm manufacturing process; 'Yorkfield' core; 4MB(4x1MB) L2 cache; 8x multiplier; R0 stepping; 95W TDP.

As you've probably already read just now, AMD's latest chip just edged over the 4GHz mark. When Intel sent us its quad we didn't have such a high expectation – but we proved ourselves wrong! This has two more cores than the Phenom X2 and a lower starting clockspeed, but who comes out on top?

Built on the 45nm process that Intel has now got worked down to a fine art, there are 456 million transistors packed into a die of only 164mm2. It's based around the same Yorkfield die as all recent Core 2 Quads, but has a cut-down amount of L2 cache at only 1MB per core. The 95W TDP is very similar to Intel's Quads in this series, and the 8x locked multiplier means that you don't have too much wiggle room on that side. Unlike the Q8200 this chip has Virtualisation tech enabled, as well as all the usual 64-bit features. This runs on a 333MHz FSB for an effective speed of 2.66GHz. On paper it's reminiscent of the incredibly popular Q6600, and pricewise it's perfectly situated at $260.

Unlike AMD's native quadcore design, the Core 2 Quad is essentially two Core 2 Duo dies sticky taped together to form something that is very similar to a native quad. This means that Intel can get very high yields on their chips, and are very flexible when it comes to mass-producing them. Unfortunately this CPU isn't quite as easy to work with as the AMD; but in no way does that mean it's a huge challenge. Throwing it into our P45-based test-rig with a trusty TRUE heatsink on top, we got around to benching and what we found was very interesting.

Compared to AMD's chip at stock speeds, the Intel chip loses out across every test except for multithreaded ones. The slower clock speed and memory controller located in the northbridge (as opposed to on the die like AMD) means that the latencies here in the tech keep the quad just behind the competition. When we dialled in our second OC level we got much the same story as at stock, tailing just behind without quite beating the AMD silicon. The third level is where we saw the Q8400 catch up to and actually beat the AMD processor in some singlethreaded benchmarks, which was very impressive. Of course the extra two cores available to the Quad completely decimate the dualcore in multithreaded apps, wiping the other CPU over the floor. The important question is though; can it beat the 4GHz overclock?

We sat down and deftly raised the FSB to 500MHz, which gave us an incredibly easy 4GHz overclock at only 1.4V Vcore. This is something that you can almost literally dial in and be happy with assuming you have an aftermarket cooler, and is a great display of the tweaking that Intel has put into their R0 stepping silicon. Not content with such an easy leap, we kept pushing the FSB up until we topped out at a maximum of 518MHz at 1.4625V – giving us a final maximum speed of 4140Mhz. For a quadcore to best the overclocking capacity of a dualcore is impressive enough; for it to do it on an identical heatsink to a CPU with lower TDP is even more so. The Q8400 might not have a huge amount of cache compared to other chips, but in the race between the two in this magazine we're going to call it on the blue team's side this time – for only $115 more you get two extra cores and more overclocking headroom; what's not to like? **JR**

Intel Q8400 2.66GHz

Q8400	333x8; DDR2-1066 5-5-5-15	378x8; DDR2 5-5-5-15	423x8; DDR2-1015 5-5-5-15
PiFast	36.68s	32.37s	29.69s
wPrime 32M – single thread	56.55s	49.25s	44.616s
wPrime 32M – multi-thread	14.445s (3.92x efficiency)	12.699s (3.88x)	11.341s (3.93x)
CineBench R10 64-bit – single thread	3177	3610	3990
CineBench R10 64-bit – multi-thread	11329 (3.57x efficiency)	12818 (3.55x)	14500 (3.63x)
Everest Read	6618MB/s	7480MB/s	7408MB/s
Everest Write	7081MB/s	8030MB/s	8982MB/s
Everest Latency	81.6ns	72.4ns	72.9ns

Performance 88
Four cores help this one along.

Overclockability 94
Better than AMD can offer!

Value 87
A very reasonable asking price.

Overall
Not the best, but overclockers will enjoy playing around.

89%

Foxconn Flaming Blade

Smiting price tags and making waves.

Street Price $285 **Supplier** Altech
Website www.altech.com.au
Specifications Socket LGA1366; Intel X58 chipset; ATX form factor; 2x PCIe x16; 1x PCIe x4; 1x PCIe x1; 2x PCI; 1x EIDE; 6x SATA; DDR3-1800

Foxconn has had some rather oddly named boards in the past (such as its Destroyer online here: **www.atomicmpc.com.au/?132288**), but the Flaming Blade is the coolest damn name that's been given to a piece of tech in a damn long while. The colour scheme even manages to match it admirably; an all-black PCB with black and red components, highlighted by splotches of dull silver. It's the kind of board you fall in love with at first sight, and one that we're very taken with.

Based around the enthusiast X58 chipset this mobo has plenty of PCIe 2.0 lanes for either Crossfire or SLI, as well as enough room for a sound card or similar thrown into the mix. It features a 65nm northbridge chip that doesn't include a memory controller, which has been relocated onto the CPU die itself. The chip is located in the centre of the board underneath a large black plate, complete with brushed stainless steel logo and an extruded cover that reaches down to the southbridge. Even the power regulation is treated to a black and red heatsink, proudly baring the Flaming Blade name for all to see.

Expansion options are pretty good: eight USB, PS/2, optical, two Ethernet, two eSATA, 7.1 channel audio and a Clear CMOS button are all present. Audio is powered by a Realtek ALC888 audio chip, and should offer decent quality. The front panel audio header is in the bottom left corner of the board, lying next to the Floppy socket. Two USB headers are also along the bottom edge, accompanied by a front panel header and power/reset buttons. There's also an LED POST screen here that helps to identify hardware boot problems, though when POST is complete it doesn't show any other information, like temperature readings.

A right-angled IDE socket is on the right edge of the board, with six vertical SATA ports placed just out of the way of the first PCIe X16 slot. We'd swap these storage options in preference of SATA ports, but design-wise it makes perfect sense. The 24- and 8-pin power connectors are in the best places for easy use and cabling, but there's also a big red button next to the 24-pin socket. Usually these kinds of buttons make something self-destruct, but this one simply forces a hard reset of the motherboard – which can be very helpful if your overclock is being uncooperative. A very handy feature we haven't seen before is the header to turn off the rear Clear CMOS button, to prevent accidental pressing.

Three DDR3 slots, as opposed to the usual six, offer the same three channels, and as most people won't need more than 6GB of memory this is again a very good design choice that saves on money and PCB complexity. Doing so also means that there's less circuit traces running from the LGA1366 socket, meaning that mounting holes for both LGA1366 and LGA775 are present – you can run older heatsinks or waterblocks just fine on this mobo.

Overclocking was a relatively simple affair on the board, with most options labelled clearly. The menu structure was a little awkward at first, but once we'd found everything it was a breeze. We hit a max QPI of 164 on our engineering sample i965, which is just a shade off the maximum we've gotten it to before. This is above average overclocking performance, and definitely welcomed.

Of all the great ideas in the mobo, perhaps the best thing about it all is the price – weighing in at only $285 you'd be completely stark-raving mad not to pick this one. It overclocks well, has everything you'd need (and more), and is affordable. Go buy one now! **JR**

Foxconn Flaming Blade

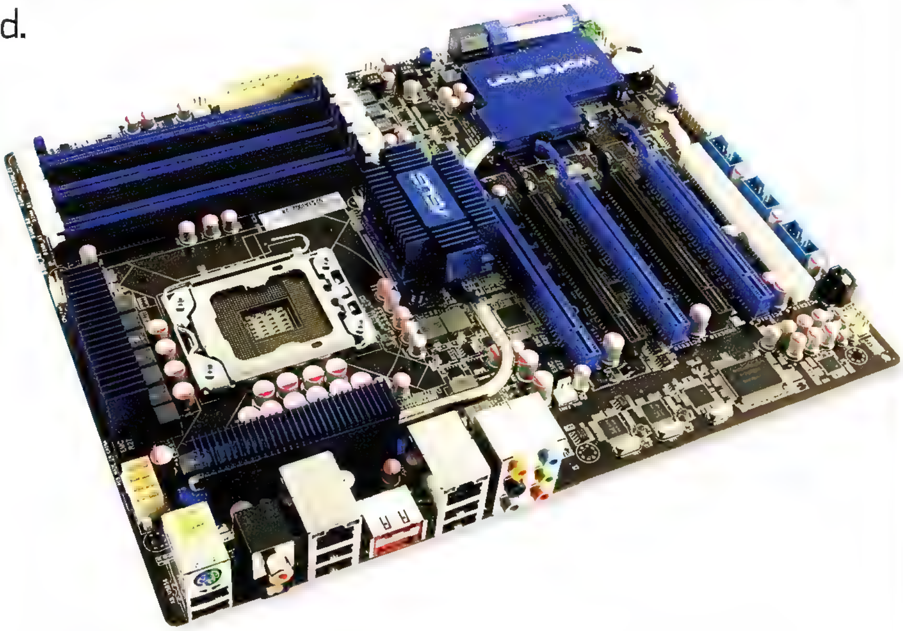
i965	133x24; DDR3-1600 8-8-8-24; 3.2GHz	150x24; DDR3 1500 8-8-8-24; 3.60GHz	160x24; DDR3-1604 8-8-8-24; 3.84GHz
PiFast	26.52s	23.51s	22.96s
wPrime 32M – single thread	40.703s	36.285s	35.49s
wPrime 32M – multi-thread	7.646s (5.32x efficiency)	6.835s (5.31x)	6.597s (5.38x)
CineBench R10 64-bit – single thread	4580	5172	5403
CineBench R10 64-bit – multi-thread	19453 (4.25x efficiency)	21248 (4.11x)	22190 (4.11x)
Everest Read	16586MB/s	18512MB/s	16799MB/s
Everest Write	12037MB/s	17296MB/s	14337MB/s
Everest Latency	55.2ns	50.4ns	48.1ns

Performance Overclocks very well.	92
Value Damn near the best for the money.	98
Features Stick + poke = win	95
Build Some odd choices, otherwise great.	87
Overall To say that this mobo is merely impressive is a gross understatement.	96%

ASUS P6T6 WS REVOLUTION

More expansion options than God.

Street Price $715 **Supplier** ASUS
Website www.asus.com.au
Specifications Socket LGA1366; Intel X58 chipset; ATX form factor; 6x PCIe x16; 6x SATA; 2x SAS; DDR3-1800



ASUS has a long tradition of creating motherboards for workstations, chucking a WS into the name to show that they care. The company also has a tradition of packing more tech into the one piece of silicon than seems practical or even useful – in this case every single piece used in the board offers something. While it's not quite as impressive as its P6T7 board we heard rumours about back in March (**www.atomicmpc.com.au/?138972**), it's still got an almost-silly amount of stuff crammed in.

Based around the same X58 chipset that is very popular thanks to the huge amount of PCIe 2.0 lanes available, this mobo also packs in two NVIDIA NT200 chips to allow a phenomenally huge six full-length PCIe slots. This means up to six single-slot graphics cards can be installed, meaning that you can splurge on six 9800GT cards and build yourself the world's most insane folding@home computer. Not only can you use graphics cards with the slots, but any other device that uses PCIe will also work; this opens up a world of professional RAID cards and the latest tech such as PCIe SSD storage cards that are beginning to pop up.

The back panel expansion is pretty standard, with a PS/2, six USB, optical/coaxial, two Ethernet, two eSATA and 7.1 channel audio driven by an ADI AD2000B chip. 24- and 8-pin power are placed in the best spots, while the power regulation all around the CPU socket is treated to an electric blue heatsink. The northbridge and southbridge/NT200 chips are also covered by heatsinks and joined together via a single large heatpipe. There's enough room around the socket for any heatsink size, and plenty of clearance for memory. Six DDR3 slots are included for up to 24GB of memory.

Five fan headers, including the CPU header, are dotted around the mobo, while every single piece of spare real estate is coated in resistors, circuit traces or components. It doesn't get more packed than this! Storage options are provided in the form of six right-angled SATA ports on the right-hand edge of the board with an additional two black SAS ports. A power LED is in the bottom corner next to the front panel headers and battery.

Three USB headers lie along the bottom edge of the board, along with an audio in the bottom-left. There's no IDE or Floppy connectivity included on the mobo at all – our guess is that real estate was too valuable for that, and since most things are SATA now it doesn't really matter that much anyway. Solid capacitors and ferrite chokes were used all over the PCB, which is most likely an eight-layer to allow all those components to 'talk' to each other easily.

If you're building yourself a workstation the last thing usually on your mind is overclocking, but since this is built around the X58 chipset it has more than enough capability. We bumped in our standard benchmark settings, but found that we needed to add more Vcore to the CPU to get them running stably compared to normal boards. Vdroop didn't seem to be an issue, simply that the board demanded more voltage. We topped out at 164 stable QPI, but still managed to get a Cinebench multi run at 165 with a score of 22,222. It crashed soon after. We added enough voltage for most sane people to gasp at, with even the motherboard complaining about us running the CPU at over 1.6V when booting.

If you keep it sane though, you can expect decent overclocking with this mobo. The price is really the biggest downfall – at over seven hundred bucks you've gotta be dead sure that this is what you want. **JR**

ASUS P6T6 WS REVOLUTION

i965	133x24; DDR3-1600 8-8-8-24; 3.2GHz	150x24; DDR31500 8-8-8-24; 3.60GHz	160x24; DDR3-1604 8-8-8-24; 3.84GHz
PiFast	26.43s	23.54s	21.26s
wPrime 32M – single thread	40.81s	36.395s	34.114s
wPrime 32M – multi-thread	7.706s (5.30x efficiency)	6.849s (5.31x)	6.507s (5.24x)
CineBench R10 64-bit – single thread	4785	5241	5664
CineBench R10 64-bit – multi-thread	19765 (4.15x efficiency)	21046 (4.02x)	23256 (4.11x)
Everest Read	17468MB/s	15871MB/s	16961MB/s
Everest Write	13958MB/s	13493MB/s	14397MB/s
Everest Latency	48.9ns	50.9ns	47.6ns

Performance Finicky with Vcore.	89
Value A lot to ask for a motherboard.	65
Features They've packed a lot in.	93
Build Some omissions, solid.	85

Overall
It's great for expansion, but huuuuge price.

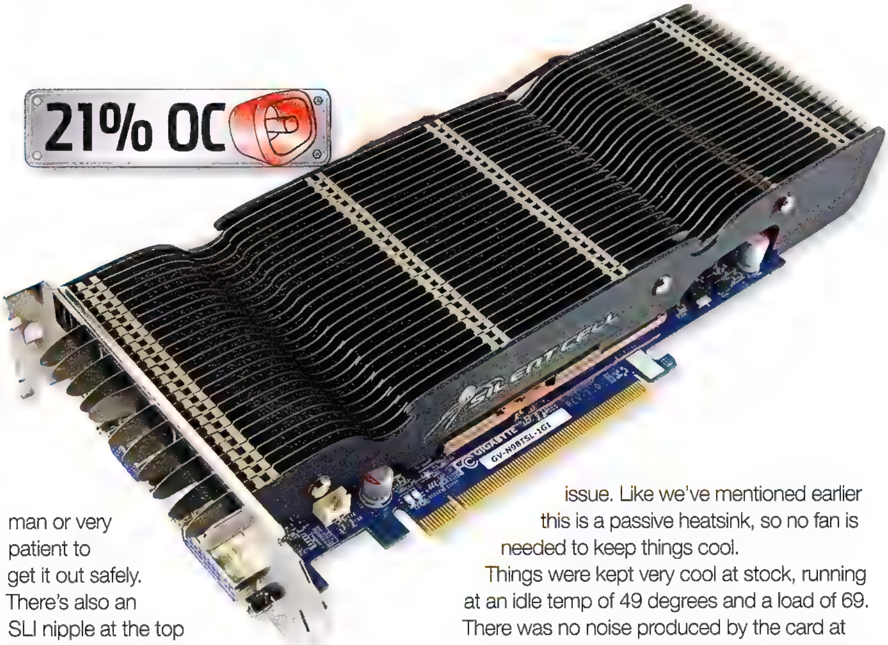
87%

GIGABYTE 9800GT Silent Cell

Noiseless cooling done well.

Street Price $215 **Supplier** GIGABYTE
Website www.giga-byte.com
Specifications 600MHz core; 900MHz memory (1800MHz effective); 1500MHz shader; G92b core; 112 stream processors; 1GB GDDR3; 256-bit memory interface; dual slot PCB with active cooling; 6-pin PCIe power connector
Card info www.techpowerup.com/gpuz/m3puk

21% OC



If you've ever spent money on a graphics card, lovingly installed it into your rig and finally turned it on, odds are that you've probably been hit by a teensy little fan whirring along at 100 per cent speed. These little screamers are going out of style now, but the replacement beefy ones are just as bad – with power consumption of just the fan reaching almost an entire amp, they sound more like a leafblower than a cooling fan! There's a special breed of cards out there that aren't afflicted by this noise though; passively cooled cards. GIGABYTE sent us its latest design, mounted to a 9800GT, so we turned the heat up far as we could push it.

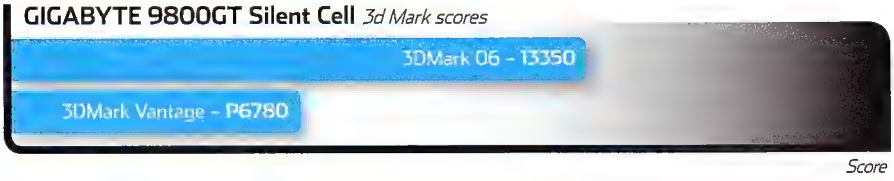
Based around the G92 core that we're familiar enough with we can tell you where each individual pin is without even looking, it's a 55nm-based chip with 112 stream processors running at the reference speed of 600MHz. An entire gigabyte of GDDR3 memory runs alongside the core at a speed of 900MHz, getting data through a 256-bit wide memory bus. There are many iterations of this core, but this is the most common. While it is PCIe 2.0 it still needs an external PCIe 6-pin power connector.

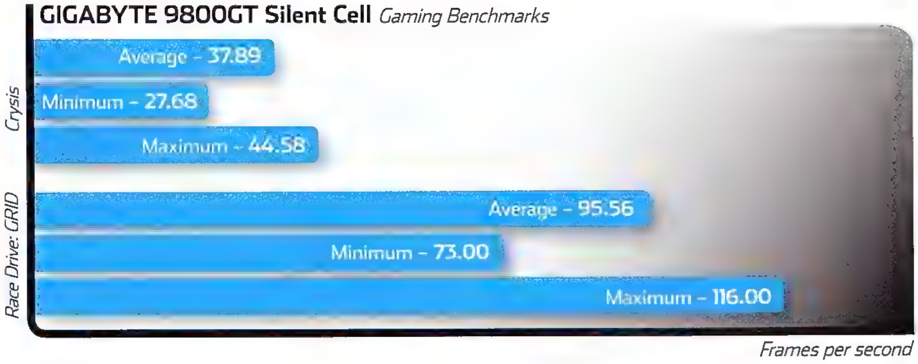
And funnily enough, here we hit a small problem – the power connector is placed in a very awkward position, right against the heatsink. It's easy enough to connect but unplugging a cable from the card was an exercise in finger-batics, meaning you'll have to be either a rubber-man or very patient to get it out safely. There's also an SLI nipple at the top of the card, but this is easy to access even if you're running it in SLI with another card. A DVI, VGA and HDMI port round up the video connections.

Physically this card is erring on the side of just a little huge, rivalling the length of full-size cards in heatsink alone. Cooling is essentially a very large copper base (about 8cm^2); three thick heatpipes suck heat away from there and channel it along to the thin aluminium fins. There is a very large gap between every single fin, taking advantage of any airflow in the case to get rid of as much heat as possible. The expansion bracket has extruded fins poking through it (right next to the DVI port), and thermal convection suggests that cool air outside the case will be sucked in through there to cool the fins – though dust might become an issue. Like we've mentioned earlier this is a passive heatsink, so no fan is needed to keep things cool.

Things were kept very cool at stock, running at an idle temp of 49 degrees and a load of 69. There was no noise produced by the card at all, something that's very welcome. Surprisingly when we got to overclocking the card, our low expectations were met with a core that managed to reach 724MHz (plus twenty one per cent), and we could also squeeze out 1050MHz(another seventeen per cent) on the memory even though they weren't cooled by even a heatsink! This was under testbed conditions, so cooling performance may vary depending on your case and airflow setup.

You'll pay roughly an extra $60 over a generic 9800GT to get this Silent Cell version, and performance in games is predictably decent, giving a playable everything without too much worry. This card would be a great choice for those looking for a nice quiet gaming rig, or even a dual-purpose media centre – and you can even get some overclocking done on it too. **JR**





Performance	Nice, but also a great overclocker.	82
Bundle	Cables, but no game.	75
Value	Pricey, but such is the cost of silence.	84
Build	Huge, cools well.	88

Overall
It's a decent performer that won't make a peep.

85%

Sapphire 4890 VaporX Toxic

Toxic Vapor may or may not be lethal.

Street Price $TBA **Supplier** Anyware
Website www.anyware.com.au
Specifications 960MHz core; 1050MHz memory (4200 effective); RV790XT core; 800 shader units; 1GB GDDR5; 256-bit memory interface; dual slot PCB with active cooling; 8-pin, 6-pin PCIe power connector
Card info www.techpowerup.com/gpuz/fu2xr/

6% OC

atomic hot award

Continuing the longstanding tradition in the graphics card industry of increasingly complex nomenclature for their products, Sapphire has fused its VaporX and Toxic series into one single 4890 card. VaporX indicates Sapphire's special cooler, and Toxic means overclocked – both of them together should equal 'awesome'.

Indeed from first look the card does appear awesome, covered in a large black plastic shroud with single large 92mm fan mounted in the very centre of the card. Three thick nickel-plated heatpipes run along the top edge of the card, and these meet with the contact plate on the core. Using a special cooling method that is essentially a very large and flat heatpipe, the VaporX chamber takes the heat away from the core very quickly to be moved around by the heatpipes. A series of thin aluminium fins dissipate the heat from the core, effectively sitting in a wind tunnel created by that plastic shroud. Most of the heat is dumped out the back of the case, but some heat will also be vented into the case itself.

Due to this card being specially overclocked, it needs one of the usual two 6-pin PCIe power connectors to be increased to an 8-pin; but most modern power supplies will support the latter just fine. The cooler dealt with this increased heat load admirably, returning 46 degrees at idle with 56.8dBA and 59.7 load with 59.7dBA. This isn't the quietest nor coolest heatsink we've seen, but for what it is it manages quite well.

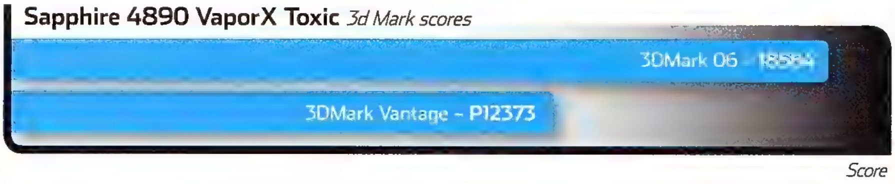
The core running in the card is the RV790XT, which is a heavily tweaked version of the RV790 core that runs in the 4870. It's had a few (read: four million) transistors added around the outside of the core that act as a stabilisation ring of sorts, allowing very high clockspeeds while remaining stable. This series runs a cherry-picked assortment of these cores (well, just one per card) that are able to run at factory settings of 960MHz, a stock increase of 110MHz over the already high 850MHz reference speed. Not only do they come with the faster core speed, but the memory chips used are very fast at 1050MHz; that gives an effective 4200MHz. Eight hundred shader units are used to allow games to be devoured, and there's plenty of space too with an entire gigabyte of GDDR5 memory running on a 256-bit memory bus.

Thanks to the upgraded cooler and nicely picked core, we were able to push it a little when overclocking – reaching just over a gigahertz to 1020MHz on the core. That six percent increase was matched and beaten by the memory chips going up nine per cent to 1145MHz, giving both a core and memory speed that was much faster than we've seen from any single-cored card yet.

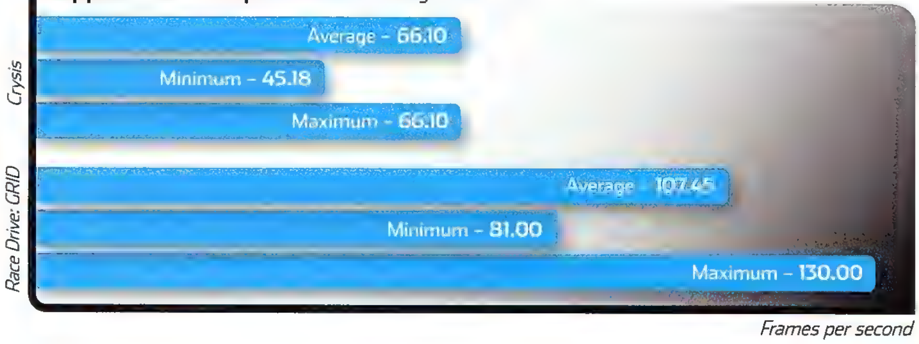
Gaming performance is the best we've seen from a single-cored card, nabbing top spot in every benchmark and game test we had. It even managed to rip around the GRID racetrack with an average of well over a hundred frames a second. Sure, you might only be able to see sixty of them (thanks to your monitor's very likely 60Hz refresh rate) but it's still a good sign that this card will have the longevity to tackle demanding games in the future.

While we don't have a price for this beast yet, you can expect it to be somewhere between very affordable and "Where did all my money go?" – but expect it to be closer to the latter. If you need the best in a single cored card though, this is a damn tempting choice that'll keep you happy for a long time – long enough for the next best thing to come around, anyway. **JR**

Sapphire 4890 VaporX Toxic *3d Mark scores*



Sapphire 4890 VaporX Toxic *Gaming Benchmarks*



Performance	Single core, over 1000MHz!	96
Bundle	3DMark Vantage, PowerDVD 7	85
Value		N/A
Build	Cool and inoffensive.	91
Overall	Nothing but the best in single-cored card.	92%

ASUS 4770 TOP

Sittin' on top of the manufacturing world.

Street Price $TBA **Supplier** ASUS
Website www.asus.com.au

Specifications 800MHz core; 850MHz memory (3400 effective); RV740 core; 640 shader units; 512MB GDDR5; 128-bit memory interface; dual slot PCB with active cooling; 6-pin PCIe power connector

Card info www.techpowerup.com/gpuz/5ba4b/

The 4770 is ATI/AMD's sucker punch right into the 'nads of NVIDIA, screaming with all the fury of a karate-trained midget and striking fear deep into the heart of the green team. Because not only is this 4770 the first 40nm desktop card, it's also priced incredibly competitively compared to – and in most cases lower – than the 9800GT. It runs cool, is very cheap to manufacture and has a lot of overclocking potential, which has NVIDIA in a bit of a pickle for now.

The core that runs in the 4770 TOP is called the RV740, and it contains 640 shader units that run at an increased core speed of 800MHz, and 512MB of GDDR5 memory on a 128-bit bus at 850MHz. It's also got 826 million transistors, but takes up about the same amount of space as a stack of three ten cent coins! This is great for material cost, but also makes it much easier to actually cool the tiny little chip.

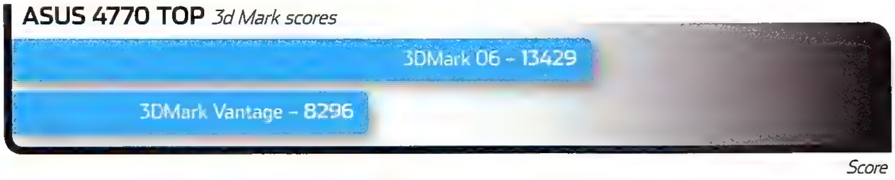
This card runs a dark red PCB with a single 6-pin PCIe power connector for external power, and the usual two Crossfire nipples at the top of the card. Up to four of these cards can be run together for a big performance increase, and you can also mix/match with other cards in the 48xx series. Two DVI ports and an analogue-out round out the expansion options, while the card interfaces with a 16x PCIe 2.0 slot on a mobo. This particular model comes with a new feature called Voltage Tweak, which is a software-controlled core voltage modifier that ranges from 0.95-1.25V, and should make it easier to get your overclocks stable.

The heatsink used on the card isn't the reference cooler, but is a custom designed copper model that looks almost like a less-elegant Zalman design. Fins extrude from the centre copper block and form a 'flower', inside which resides a single cooling fan. A plastic shroud is installed over this to channel airflow a little, but if you don't like it then four screws can remove the slightly-tacky plastic. There are no heatpipes or aluminium fins used in this design at all – the thermal output of the core is low enough not to need them. Strangely the memory chips aren't covered by a heatsink, and instead rely on the airflow provided by the fan to keep them cool. They got a little warm at stock, but nothing too disconcerting – after all, GDDR5 should run slightly cooler thanks to the lower voltage requirements. The heatsink kept the card at 40 degrees idle and 53.4dBA, with a load of 60 degrees and 55.6dBA.

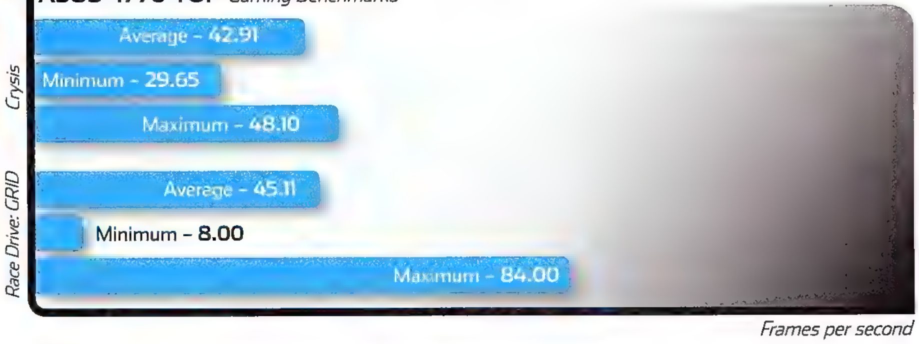
Overclocking yielded a little extra performance, as we squeezed 865Mhz from the core (plus eight per cent) and a phenomenal 1200Mhz from the memory (A whopping FOURTY-ONE per cent). This was a very surprising result from the memory, giving us an effective speed of 4800MHz and a bandwidth of 61.4GB/s. Sure those memory increases aren't going to be anywhere near as noticeable as the core increases, but it's a very good sign that ASUS has used top-notch memory chips here, suggesting that the other components used might also be very high quality.

The bundle with this card isn't very astounding, only including the cables and driver CD, nor does the core manage to hit the 934MHz that XFX's offering did last issue – but it's still got good performance in all our benchmarks and games, with a decent increase over the reference design thanks to the small factory overclock. **JR**

ASUS 4770 TOP *3d Mark scores*



ASUS 4770 TOP *Gaming Benchmarks*



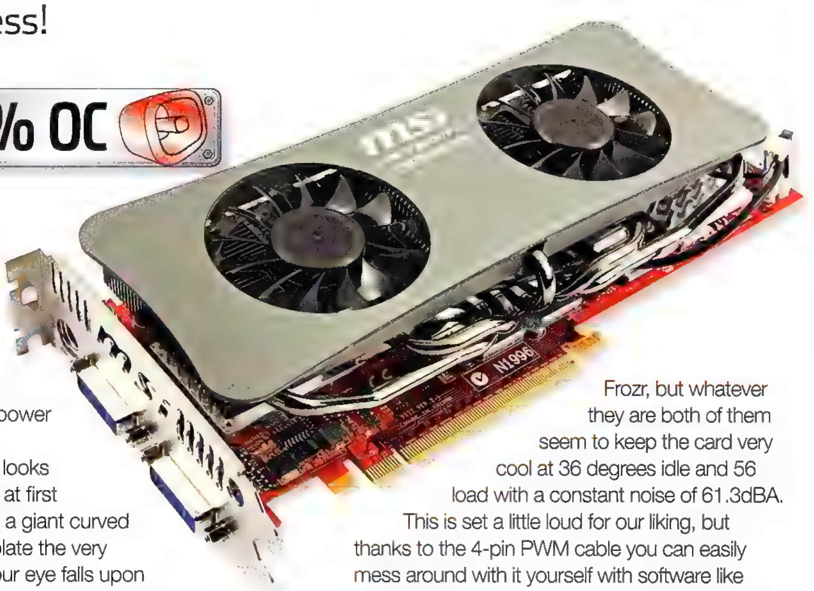
Performance	Good, overclocks well.	82
Bundle	Cables, driver disc, no game.	75
Value		N/A
Build	Great components used.	90
Overall	A mixed bag of good and adequate.	84%

MSI GTX275 Twin Frozr OC

Now with twice the frozr-ey goodness!

Street Price $460 **Supplier** MSI
Website www.msi.com
Specifications 666MHz core; 1161MHz memory (2520 effective); GT200 core; 240 stream processors; 896MB GDDR3; 448-bit memory interface; dual slot PCB with active cooling; dual 6-pin PCIe power connectors
Card info www.techpowerup.com/gpuz/u5kyv

11% OC



We'll kick this off by wondering out loud just exactly what a Frozr is, and why this card needed two of them. Well we still don't know, but when MSI sent us a single card that claimed to have twice the Frozr of other cards we've looked at, we leapt at the chance to find out for ourselves.

The MSI GTX275 Twin Frozr OC graphics card is a mouthful built around the GT200 core at 55nm with 240 stream processors, and 896MB of GDDR3 memory on a 448-bit memory bus. It's slightly overclocked from reference clocks on both the core and memory; this isn't a huge increase, and it should hopefully leave us with some headroom later on to do our own pushing. The GT200 core is a physically massive chip, but electrically it demands quite a lot of power, which is supplied through the two PCIe 6-pin power connectors.

This card looks pretty funky at first glance, with a giant curved aluminium plate the very first thing your eye falls upon as you pull it out of the packaging. It's got two 80mm fans with slightly translucent blades, though these aren't lit by LEDs. Under the hood the Twin Frozr's running a giant aluminium plate that mounts directly to the core, where a series of five nickel-plated copper heatpipes work together to take the heat away from the core as fast as possible. They're threaded equidistantly throughout the heatsink and no one area felt warmer or cooler than another, a very good sign that this heatsink is doing just what it's designed to do. The standard aluminium fins provide the actual cooling surface, and heat escapes around all sides of the card directly into the case. Extruded aluminium heatsinks on either side of the main core mounting plate also cover the memory and power regulation, extending the length of the cherry-red PCB.

We couldn't find anything approximating a Frozr, but whatever they are both of them seem to keep the card very cool at 36 degrees idle and 56 load with a constant noise of 61.3dBA. This is set a little loud for our liking, but thanks to the 4-pin PWM cable you can easily mess around with it yourself with software like Rivatuner. The Frozrs helped us overclock this card a little too, bumping the core up to 738MHz on the core (plus eleven per cent) and 1280MHz on the memory (ten per cent up). Insofar as overclocks go this is pretty good, though certainly nothing extraordinary.

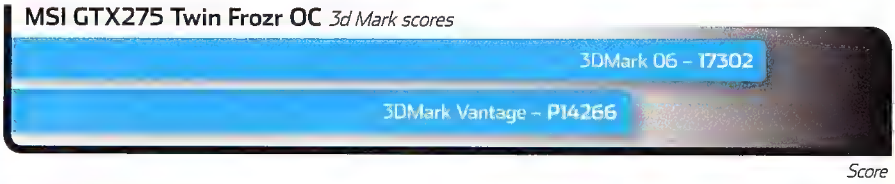
Performance in games and benchmarks was pretty good; churning through GRID like tomorrow was already yesterday, ripping through Crysis faster than a kid opens an N64 at Christmas and beating 3DMark benchies faster than a chef can whip up a cake.

Sadly this card is very light on bundle, only including cables and driver CD with no game. It's not very much expense to add a game in, but considering this card is already about a hundred bucks more expensive than a reference GTX275 you need a little extra something to justify that price leap – and even two Frozrs isn't quite enough. **JR**

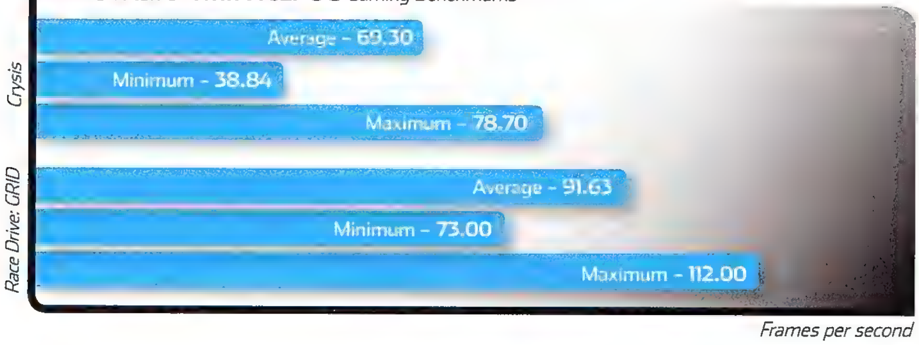
Rumour Mill

NVIDIA has been lagging behind ATI's 40nm process for now, but a rumoured GT300 chip has been floating around the interwebs for quite some time. It's the same as any rumour however; with half a billion stream processors and ten quintillion jiggawatts power consumption. Whatever the truth is, we guess that we'll be seeing their next core out later this year sometime – just in time for an end-of-year upgrade, perhaps! Ah, the joy of the cutting edge.

MSI GTX275 Twin Frozr OC *3d Mark scores*



MSI GTX275 Twin Frozr OC *Gaming Benchmarks*



Performance	Nice, and overclockable too.	90
Bundle	Lighter than a green salad for lunch.	71
Value	Okay, but needs more stuff included.	74
Build	Cools well, noisy.	83

Overall
A solid choice with a large-ish price.

82%

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Thermaltake ISGC-400

Silent as the grave; hotter than pop music.

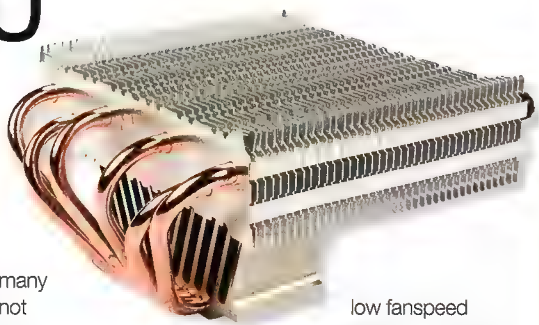
Street Price $75 **Supplier** Anyware
Website www.anyware.com.au
Specifications Flatbed heatsink, 6 heatpipes, aluminium fins, 120mm variable fan included

Thermaltake has made some pretty wildly designed coolers over the years, bringing us such fanciful 'sinks as the V1 and the DuOrb. This one is a little more conservative on the imagination side, but on paper it offers just about enough to make up for it. Whether or not it can live up to that is another thing altogether, so let's first look at the heatsink proper.

Called the ISGC-400 for absolutely no other reason aside from a funky sounding name, it has a very smooth copper base that's polished to such a good mirror shine that we can actually read reflected text with it! Six 6mm copper heatpipes all lie underneath it, which are sandwiched to the base by a piece of thick aluminium fashioned into a smaller secondary heatsink. The heatpipes bend outwards and upwards, curving back on themselves to form a large platform where many aluminium fins have been placed – though not soldered. An included 120mm fan installs on the top with wire clips.

Installation of the heatsink was simple, and the included retention brackets cover AM2, LGA775 and LGA1366. It even includes plastic and foam insulation for the motherboard; which is essential for creating a tight fit onto the CPU. The fan also has a variable rheostat connected to it that makes nary a whisper at low speed of only 46.3dBA, but a rather loud 57.1dBA at high.

Under our stock test it passed on both settings, but under our torture test both high and low fanspeed failed – the CPU hit over eighty degrees in five minutes (high) and one minute (low). The spacing of the fins and tightly packed heatpipes seemed to bounce a lot of the airflow back, rendering the fan less effective. It might not perform the best, but if you're after actively-cooled dead silence then you really can't pick anything else. **JR**



Thermaltake ISGC-400

	Load FanLow	Idle FanLow	Load FanHigh	Idle FanHigh
3.2GHz, 1.2V	72	43	65	39
3.6GHz, 1.35V	FAILED	45	FAILED	43

Overall
Can't handle huge heat, but quiet on low revs.
82%

Cogage TRUE Spirit

Budget heatsink that holds nothing back.

Street Price $59 **Supplier** Thermalright
Website www.thermalright.com
Specifications Tower heatsink, 8 heatpipes, aluminium fins, 120mm fan included
Gallery www.atomicmpc.com.au/?145887

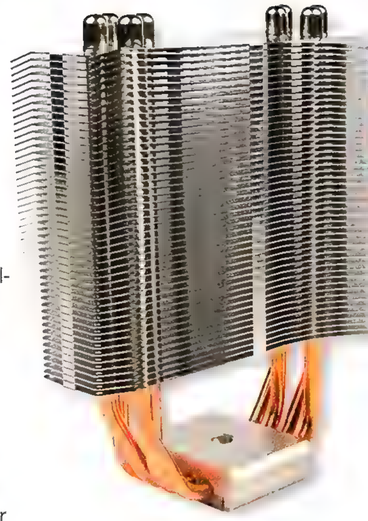
Thermalright is the manufacturer of the most popular enthusiast heatsink right now – the ThermalRight Ultra 120 Extreme (aka the TRUE 120). The company's just created a spinoff subsidiary brand called Cogage, but in no way does spinoff mean bad. Taking all the good design ideas from the original TRUE, can the TRUE Spirit do things better?

Built in the traditional tower setup, the nickel-plated base is machined to a very flat level with faint machining marks left. It sandwiches into a large aluminium piece, with four U-shaped heatpipes sandwiched inbetween that are soldered in place for better thermal transfer. The heatpipes bend upwards into a series of aluminium fins, though the pipes are not nickel-plated as with the Thermalright version. All the fins are also much thinner, meaning that it is both lighter and has less surface area.

Mounting gear included is only for Intel's LGA1366, which means that anyone else interested will have to source the correct mounting bracket from Thermalright that's compatible with their gear. Here they've used pushpins with very cheap-feeling plastic, so for those who loathe them or remove their heatsink often we suggest looking elsewhere.

Performance-wise, though, this heatsink is bloody impressive, returning temperatures very close to the TRUE and even managing to get through our torture test at a sedate 58 degrees! The included fan can be credited for a little of this success, and while it's noisy at 63.5dBA it kept things very much under control. To top all this off the TRUE Spirit rocks in at only sixty bucks, making it not a case of "should I" but "I'm an idiot if I don't" when building a Nehalem rig.

With a great asking price, equally great performance and an easy enough mount this is a great heatsink – one that would take many spots in our Kitlog if only for the socket compatibility. **JR**



atomic hot award

Cogage TRUE Spirit

	Load	Idle
3.2GHz, 1.2V	48	31
3.6GHz, 1.35V	58	34

Overall
Great performance and price, though limited compatibility does sting.
90%

Patriot Torqx 128GB SSD

The most thoughtful inclusion ever!

Street Price $620 **Supplier** Patriot
Website www.patriotmemory.com
Specifications 128GB (119 formatted); 2.5in form factor with included 2.5-3.5in adapter; SATA 3Gb/s

SSDs are the latest and greatest thing in storage, simply for the speed and reliability benefits that they bring to the scene. There's been one major drawback to them since release however – apart from a few prototypes at Computex, the vast majority of them come in the 2.5in form factor, just the same as laptop drives. This doesn't cause headaches when you're using one in a lappy, but when you want the same performance in a desktop system you run into problems when you go to install it – and realise that there's an extra inch missing from one of the sides!

Until now no SSD vendor has thought to really do anything about this, and while a select few Coolermaster and SilverStone cases offer a 2.5in mount now, most people have to do it dodgy or buy their own adapter. Patriot has finally thrown in an inclusion that goes with an SSD better than hydrogen goes with oxygen – they've chucked in a 2.5in to 3.5in adapter inside the box! Such a simple inclusion, but it saves all the fuss and added expense later on.

The drive itself is pretty fast too, with an average read of 214.3MB/s, an access of 0.1ms and a burst of 237.6MB/s. Copying the Crysis install gave an average of 172MB/s write, but strangely when copying the Program Files folder it would only hit 70MB/s. It seemed to have trouble with lots of small files at once, but otherwise was nice and speedy. It didn't heat up at all under load, and like most SSDs didn't make any perceptible noise.

One of the biggest downsides of SSDs are the cost – this one weighs in at almost $5 per gigabyte, and of that only 119GB is usable when formatted. Still, for a fast and large drive with included bracket you can't go past the Torqx. **JR**

Overall
A little expensive, but a great choice.

90%

Seagate Momentus 500GB

A small drive with a big memory.

Street Price $149 **Supplier** Seagate
Website www.seagate.com
Specifications 500GB (465 formatted); 2.5in form factor; SATA 3Gb/s

2.5in Harddrives are the mainstay of the mobile computing world right now, packing a lot of storage space into a small area. However, as part of a tradeoff, you can't have everything that a desktop drive has. Perhaps the most noticeable omission here is the speed reduction from the standard 7200RPM to a more sedate 5400RPM. This means that since the platters themselves are spinning slower, accessing information from them should also be slower.

While not exactly rocket surgery, this does mean that a smaller drive like this is going to be slower – but that isn't always a bad thing. Slower rotation also means significantly less vibration noise and heat, and this one was hard to hear in a quiet room while barely becoming noticeably warm. Access time was 18.3ms, and burst speed an impressive 229MB/s, but sustained read topped out at 67.6MB/s. This is more than enough to stream video and music, but compared to performance-oriented drives it's not quite as good.

It handled copying the Crysis install folder well, hitting an average 105MB/s write speed – though when copying the Program Files folder it hit only 47MB/s write. So it's not the fastest drive, but it's darn quiet and has a pretty huge amount of storage space; but what would you use this for (other than a laptop)?

The answer is that it'd be a great choice for a media centre, or even part of a case mod. Thanks to its huge data density and small size it can be whacked almost anywhere, or even two of them crammed into the same space as a single 3.5in drive. RAID1 on two of these would be an easy and relatively cheap way of offering data redundancy for all your media and pr0ns you can't lose, making this little drive very versatile. At 3.36GB/dollar, this is a decent choice for small-form-factor storage. **DH**

Overall
A bit slow, but quiet and capacious.

81%

Gigabyte GM-M8000

A surprisingly good mammal!

Street Price $75 **Supplier** Gigabyte
Website www.giga-byte.com
Specifications Macro-enabled; 800-4000dpi; 9x buttons (including side-scrolling).

Gigabyte may be better known for its internal hardware, but the company's released some solid control peripherals over the years. We were oddly taken with its very rugged GK-K8000 keyboard, and now there's a gaming mouse to match, the GM-M8000.

The M8000 is a sleek and stylish product, slimmer than a lot of gaming mice, and encased in dark grey plastic and featuring a cloth-wrapped cord. The cord's very handy and durable, though cloth cords can get a little... messy after prolonged scraping across grungy mouse-mats (see this issue's IO for more on mouse poo). It's also got a selection of weights to customise the way the mouse sits in your hand, and these sit nicely under the base of your palm; you get the increased weight you want, without making the leading edge of the mouse sluggish.

The first thing you notice when you pick the mouse up is that it's, for Editor-standard hands, kind of narrow. Off the desk, it's easy for the last two fingers of your hand to wrap under the mouse. On the desk, this leads to a more or less cramped hand position. That said, there are inset rubber grips on both sides of the mouse, so you never feel like you're in danger of losing control.

The included Ghost Engine software lets you set up macros and customise mouse settings to your heart's content, and even save up to three groups of those settings onto the mouse itself so you don't have to fiddle with the software on the road. The mouse features four DPI levels, switched via a toggle, and these can be further customised from 800 up to 4000dpi. It's very well-featured.

And, surprisingly, it's very good in-game. We've started using the kill-house training level of Call of Duty 4 for mouse testing, and with the M8000 our runs through it were all smooth and fast, with solid accuracy against the wooden targets. What's more, the mouse feet (and there's a spare set in the box) are super smooth on even a normal desktop.

This is a solidly specced bit of kit, responsive and solid, and would make all but the fattest-handed gamers happy. **DH**

Overall
A top choice for any gamer.
88%

Antec CP-850

The first non-spec design we've seen.

Street Price $235 **Supplier** Altech
Website www.altech.com.au
Specifications CPX form factor; 24-pin, 4-pin ATX, 8-pin ATX, 9x molex, 9x SATA, 2x 8-pin PCIe, 2x 6-pin PCIe.

Ever since the original ATX design standards were released back in 1995, power supplies have gone through a series of modifications to finally arrive at something what you'd be familiar with, usually a 12cm or 14cm fan beneath the PSU. That one fan has to push a lot of air through a cramped space, and with wattages topping out at over a thousand it doesn't make sense to keep it squished – which is where Antec has leapt in. The company's created a new standard called CPX that uses the same connectors and mounting location as ATX, but expands the casing in all directions to allow room for a 120mm fan at the end.

Now while this is only currently compatible with three Antec cases (the P183, P193 and Twelve Hundred), it also means that the PSU is very quiet – idling at 47dBA and 51.2dBA load. If the noise were the only thing it did well then it'd be a good enough reason to introduce a new standard but it also aids in cooling too, giving a direct path for heat to escape both the power supply and case.

Rated at 850W, there are four 12V rails that combine to give a maximum output of 768W. The remaining 5V and 3.3V lines are rated at the usual 30A and 24A respectively, so unless you're running a few hundred mice you'll be covered. We loaded up our test rig with an i965 at 3.6GHz with 1.375 Vcore and two 4890s, then ran OCCT and 3DMark Vantage at 1920x1200 concurrently.

Idle 12V rails sat at 12.101V, hitting a slightly higher 12.274V under full load. The 5V rail sat at 5.099V idle, again raising to 5.106V loaded. Both these results are well within spec for a power supply and should be more than enough to power a serious gaming rig – but the compatibility hurts. **JR**

Overall
A solid design and quiet to boot, the few who can use it will appreciate it.
85%

Aywun A1-V8

The best value heatsink we've tested.

Street Price $52 **Supplier** Altech
Website www.altech.com.au
Specifications Tower heatsink, 8 heatpipes, aluminium fins, 120mm fan included

Aywun is a brand-new player in the Aussie heatsink market, having just been shipped into our fine country with a range of 'sinks – we nabbed the A1-V8 mainly based on the pricetag of 52 bucks. Indeed our first impressions of the heatsink were not huge, with a simple tower design, but what we found in testing was nothing short of impressive.

Four 8mm thick heatpipes are bent into a U-shape to provide eight heat paths, but the coolest part of all these is that they form part of the base. They contact directly to the IHS of the CPU, sucking away the heat even faster than the elderly get through their pre-mushed dinner. There is a small aluminium block that keeps the heatpipes in place and also provides a little more contact.

A series of 56 aluminium fins are above the base, fitted onto the heatpipes without solder and shaped into a strange hybrid of an X with the curved part of a D. An included 120mm fan mounts on the flatter side of the heatsink, making nary a whisper at 48.2dBA idle and a roaring 68.2dBA at load. They've even included a little three-pin controller box to manually control fanspeed, so set it to what you like and leave it there. The unique shape of the fins means that air is channelled through and out both sides of the heatsink, cooling other bits around too.

Performance was incredibly good for such a cheap heatsink, passing our torture tests while overclocked even at the lowest fan-speed. It wasn't as good as the Cogage's delta torture result of 24 degrees, sitting at 30 degrees, but for a cheap solid heatsink it's very nice. Compatibility is even for every socket under the sun bar 478 – this truly is the best budget choice for any rig. **JR**

Aywun A1-V8

	Load FanLow	Idle FanLow	Load FanHigh	Idle FanHigh
3.2GHz, 1.2V	56	34	49	33
3.6GHz, 1.35V	61	36	64	34

Overall
Compatible with all, fan+controller included, great performance.

93%

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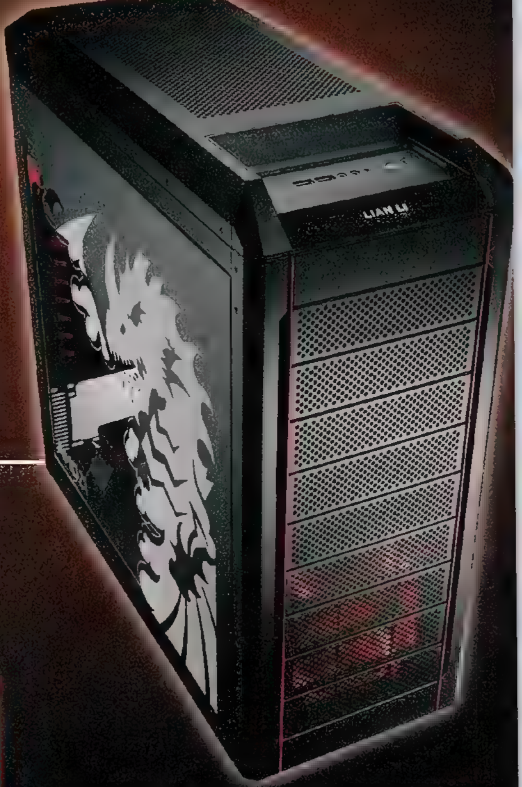

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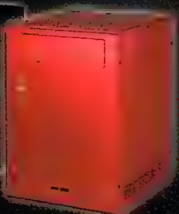
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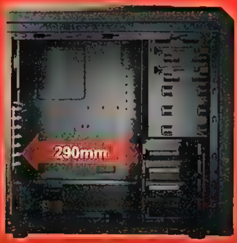
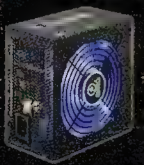


Bay		5.25" x 5, 3.5"(2.5") x 4 internal
	PC-K56/K56W	5.25" x 5, 3.5" x 4 internal
Motherboard		ATX / M-ATX
Cooling Fan	PC-K62	Front 140mm blue LED x 1 @1000RPM Top 140mm blue LED x 2 @1000RPM Rear 120mm x 1 @1500RPM
	PC-K60/K60W	Front 140mm LED x 1 @1000RPM Top 140mm LED x 2 @1000RPM Rear 120mm x 1 @1500RPM
	PC-K58/K58W	Front 140mm x 1 @1000RPM Rear 120mm x 1 @1500RPM
	PC-K56/K56W	Front 120mm x 1 @1200RPM Rear 120mm x 1 @1500RPM
I/O Ports		USB 2.0 x 2 / HD+AC97 Audio
Dimensions		214 x 496 x 498 mm (W, H, D)
	PC-K56/K56W	210 x 460 x 490 mm (W, H, D)

Extreme Power Supply



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DCA Skeleton

A different take on a solidly specced gaming system.

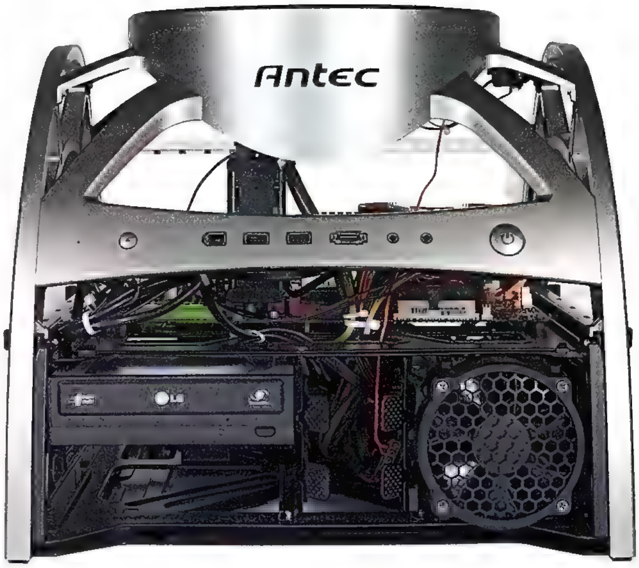
Street Price $2599 **Supplier** DCA Computers
Website www.dcacomputers.com.au
Specifications Intel Core 2 Duo E8500 3.16GHz (OCed at build); Zalman Heatsink CNPS7000C; Gigabyte EP45-DS4P motherboard; 4GB OCZ Reaper Ram @1066MHz 5-5-5-15; Palit GeForce GTX295 w. 1792MB RAM; 640GB 7200 RPM Western Digital Black Edition HDD; 22x LG DVD/RW; Antec Skeleton case; Seasonic M700 PSU; Vista Home Premium 64-bit.

We've been rather fond of the Antec Skeleton since it first crossed our desks last year. It's a wonderfully open design, unique and rather functional at the same time, especially if you're a constant upgrader of your kit like we are. Yet this is the first time we've seen one used to house a commercial system.

DCA Computers wanted to offer a PC that stood out from the crowd, and by going with the Skeleton, it's really pulled it off. Of course, if you don't like the Skeleton – and fair enough, it's not for everyone – than you've probably already skipped this review. But that would be a shame. This is a well-considered build, and very well executed.

The system's built around an E8500 Core 2 Duo that's been clocked up to just shy of 4GHz. DCA tests its clocks with a 24 hour burn in, so it's a reliable number. We certainly had no issues with the machine during benching and testing. It's ably cooled by a Zalman heatsink and fan combo, assisted by the Skeleton's own massive 200mm fan that sits atop the chassis.

With no case to channel the airflow, this setup relies more on brute force than elegance, but it really does work. Even under load the system runs cool. It does, however, run a little loud, with nothing to block out the medium-pitched whine of the whirring Zalman fan, or the turbulence of the downward 200mm fan driving air into the stream of warm air being ejected by the graphics card. It's not a gamebreaker, by any means, but if you're a sound nut or planning on watching movies, it's something to consider. For gaming, though, it won't be an issue.



Speaking of the graphics card, the Skeleton is fleshed out by a GTX 295, just about the beefiest card you can get. 4GB of RAM rounds out the performance part of the equation. So is it all up to the job?

Well, with a 295 ramming pixels into your screen, you bet it is.

3DMark Vantage returned an impressive P20,198, while its 06 counterpart delivered 17,720 3DMarks. The Vantage score is of course tipped in Nvidia's favour by utilising PhysX, but the two scores combine to show that this machine is up to the job of even the most graphically intense challenges. Like Crysis, which hummed along at our standard test settings of 1280 x 1024 with all settings set to Very High. The slowest the Skeleton got was a more than playable 31.8fps, with an average fps of a rock solid 50.51.

We've seen more than one titanically powerful Core i7 system come through the labs, and we've got to admit it's nice to see a more... sensible (which seems an odd word to be using in the pages of Atomic, we admit) piece of kit. The storage sub-systems are, again, sensible without going over the top, and yet roomy enough for most anyone. And drives are cheap these days anyway, so you can always pick an extra up later. It's also nice to see a machine with this much RAM get treated to the 64-bit version of Vista. There's no crime greater than seeing a builder go crazy on RAM, but then not install an OS that can use it (of course, given the state of modern RAM utilisation, it's bit of a moot point anyway – see this issue's X-Ray, p.14).

Not only are all the parts chosen with both performance – and the Skeleton has that in spades – and your budget in mind, but it's been put together very well, too. All cabling is neatly cable-tied out of the way wherever possible, though there are few cables that run, not haphazardly, but in awkward spots. That's more an issue of the Skeleton case, though, and unavoidable.

When you combine all this with a good warranty (one year on the system itself, three years on the CPU, and five years RTB labour), this is hard system not to recommend. It'll see you playing games for years to come, is eminently upgradeable, and, we have to say, if you're going to drop money on a pre-built system, it's nice to have one where you can really see every inch of your investment! **DH**

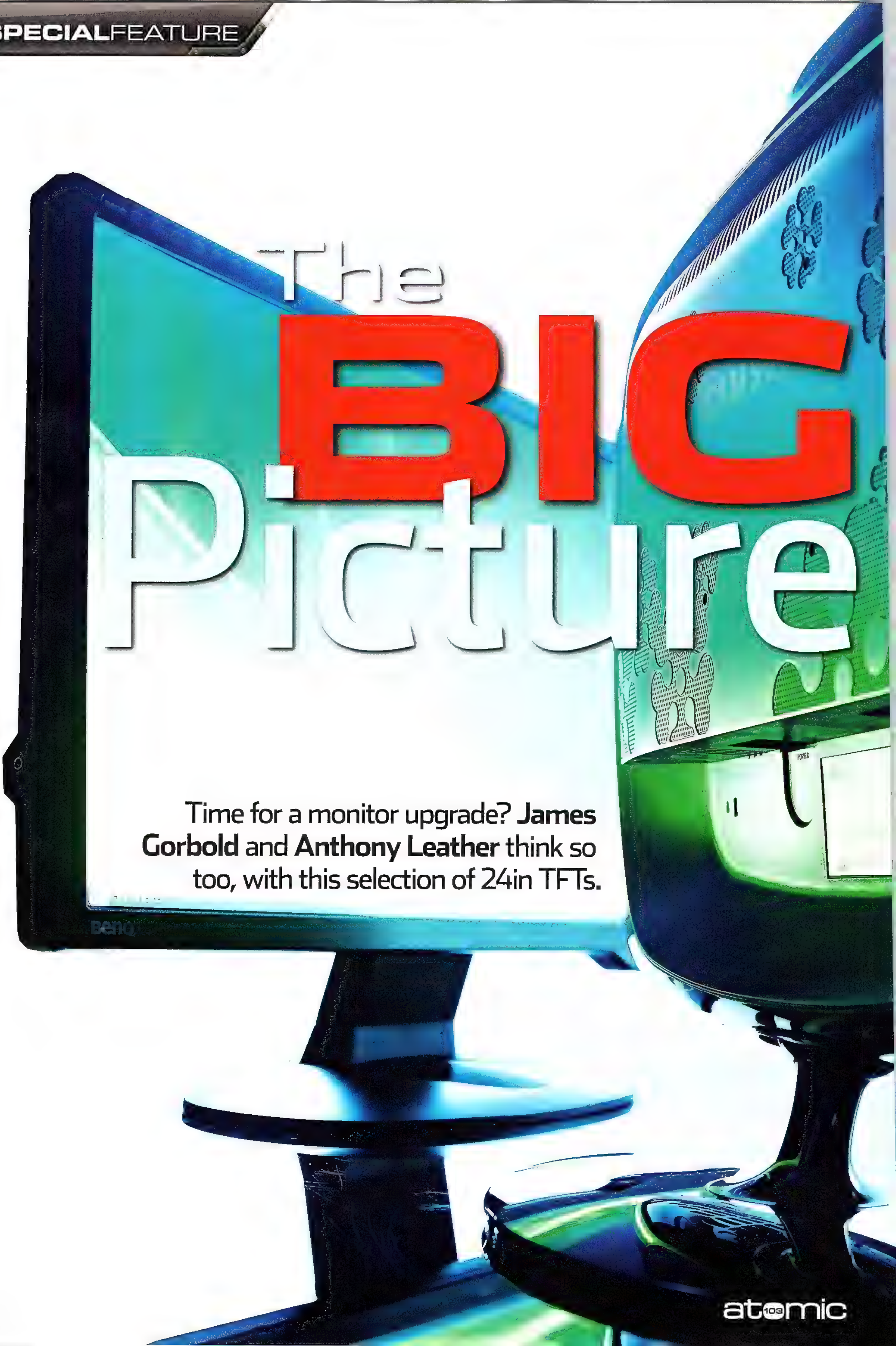
Performance If you can play it, this system can run it. **93**

Value Pretty good money for what **83**

Build Well cabled and neat. **86**

Futureproofing Wide open for the future. **92**

Overall A great mid-range gaming system, in a unique case. **88%**



The BIG Picture

Time for a monitor upgrade? **James Gorbold** and **Anthony Leather** think so too, with this selection of 24in TFTs.

Although the CPU and GPU continue to dominate the pages of Atomic, it's arguable that the most important component of any PC is its monitor. A slow CPU or GPU limits the speed at which you can run your PC, but you spend more time interacting with the monitor than any other component. You may use the keyboard, mouse and speakers most of the time, but you're always looking at your monitor.

For this reason, it makes sense to buy the best screen you can afford – in other words, the largest high-quality monitor you can afford. Image quality is paramount, as a poor quality monitor won't display games, applications and movies the way their developer intended them to be. It really isn't overstating the case to say that a poor-quality screen can ruin a movie or game. But size also matters. Apart from the benefit of a larger viewing area, a large monitor will usually (but not always) have a higher native resolution, making images and text clearer and sharper. A high-resolution monitor is also a boon if you multitask between multiple applications, as you can have lots of apps open at the same time.

For this month's Head2Head we've rounded up seven of the latest and or greatest 24in TFTs. This month, we wanted to focus on the best monitor upgrade, so we've focused on the 24in market, as 30in TFTs still command a massive price premium, while smaller models are increasingly budget-focused.

Over the next few pages, you'll find a range of different 24in monitors ranging in price from sub-$200 to over a grand, so read on to find out the best way to achieve visual nirvana.

HOW WE TESTED

In all our testing, we aim to make our analysis as comprehensive as possible. We place the emphasis on how well products perform the tasks we expect them to do. We also back this up with theoretical tests, which often help to explain what we experience during everyday usage. With TFTs, this means running various applications, from games to watching movies to using office software. We also apply industry-standard theoretical tests.

This month, we hooked up each monitor to a PC equipped with a GeForce GTX 295 graphics card to ensure we could play our test games at the native resolution of the best monitors. This card is also HDCP-compliant, so it supports the playback of Blu-ray and HD-DVD movies.

LAGOM

The test suite Lagom (**www.lagom.nl/lcd-test**) provides a scientific method for assessing white and black levels, plus dynamic range and contrast. It's widely used to compare the image quality of monitors, and is ideal for viewing on several monitors side by side to obtain the fairest results. Lagom also includes tools for optimising your monitor's setup, so we ran this first to ensure that each TFT was configured as well as possible for the real-life testing.

High definition movies

First-generation TFTs were terrible for watching movies. Their high response times meant that there were artefacts such as smearing and tearing. The low dynamic range of early TFTs also had a detrimental effect. Although TFT technology has improved over the last decade, you can still spot the difference between the best and worst monitors.

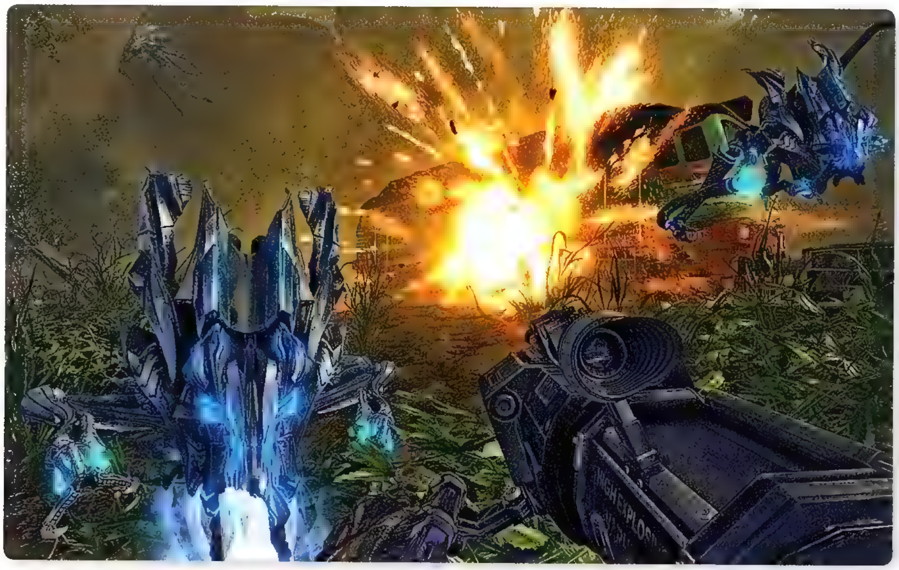
We used the 1080p Quicktime version of the trailer for the sci-fi movie 'Serenity', as this includes both fast action and slower dialogue sequences across differently lit scenes. The dark and dingy scenes in the cramped corridors of Firefly-class starship were particularly challenging for the cheaper monitors to display without losing detail. We also kept an eye out for screen artefacts and colour fidelity.

Plus, we just love that movie.

[Crysis] gives any monitor a good workout, as most levels are set in lush tropical environments.

Gaming

As with watching movies, gaming used to be a terrible experience on a TFT. Response rates are even more important when a split second makes the difference between making or missing that crucial kill which allows you to finish a level or become the victor in online play. The reduced dynamic range also gave you a choice between virtual blindness in dark areas or overblown bright regions lacking in detail – neither of which were particularly conducive to accurate crosshair aiming in a first-person shooter.



Even though TFT technology has improved enormously, response rates still vary, and the overdriven IPS and PVA panels used by many current TFTs suffer from what's referred to as input lag. Input lag is a small, but noticeable lag between the keyboard/mouse input and what actually happens in screens. Input lag is only obvious in fast-paced games such as first-person shooters, so it's worth keeping an eye out for this if you frequently play FPSes.

To measure input lag, we set up each monitor next to a control monitor, a 30in Dell 3007WFP-HC, as it has almost no image post processing and therefore no input lag. Using the clone function in the ForceWare control panel so that the test monitor was a mirror image of the clone monitor, we photographed both monitors running a software stopwatch. In theory, both monitors should display exactly the same image as that of the control monitor but, as we soon found out, some of the monitors suffered from input lag. Therefore the time displayed by the stopwatch was actually a few milliseconds behind the control monitor.

To test how each monitor copes with gaming we played through a level of Crysis. This game gives any monitor a good workout, as most levels are set in lush tropical environments with a wide range of foliage between which the monitors must distinguish.

Everyday apps

Most people don't use their PCs exclusively for playing games and watching movies, though, so our final tests involved more prosaic everyday tasks such as word processing and web browsing.

THE SCORES

Our overall scores are based on a set of four sub-scores – quality, features, value and overall.

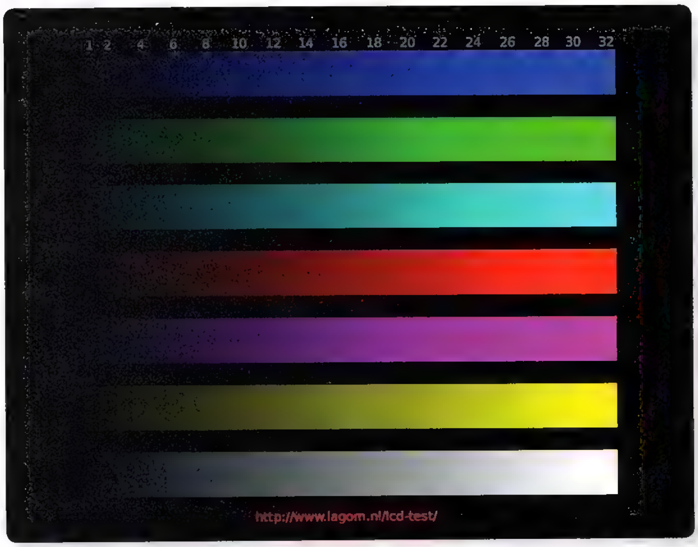
Heatsink feature table

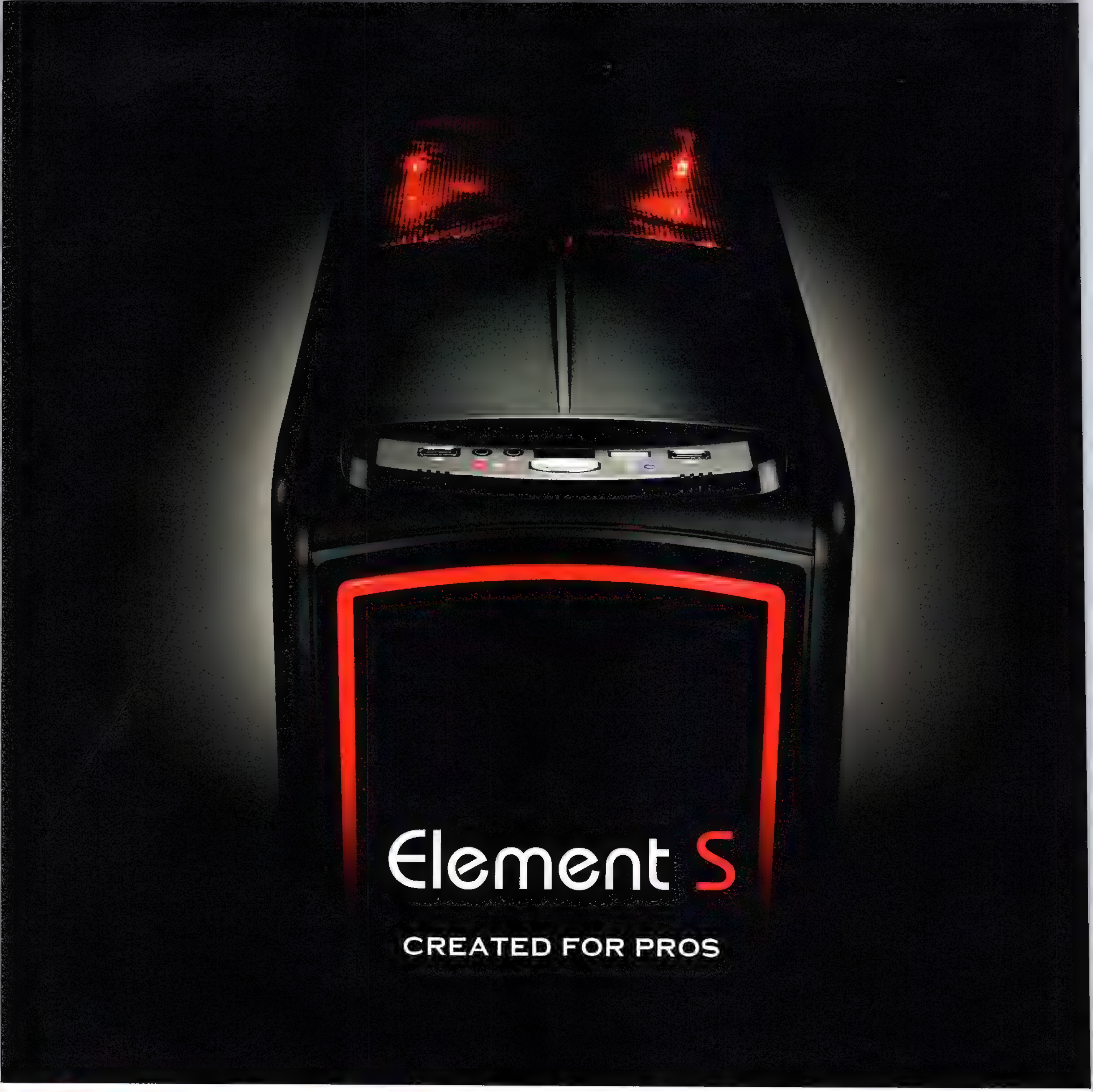
	Asus VW246H	BenQ G2411HD	Dell 2408WFP	HP LP2475w	LG W2452TX-PF	Samsung SM2433BW	Viewsonic VX2433wm
Price	$369	$499	$989	$1159	$415	$415	$379
Manufacturer	www.asus.com.au	www.benq.com.au	www.dell.com.au	www.hp.com	http://au.lge.com	www.samsung.com.au	www.viewsonic.com
Specifications							
Native resolution	1920x1080	1920x1080	1920x1200	1920x1200	1920x1200	1920x1200	1920x1080
Response time	2ms (grey to grey)	2ms (grey to grey)	6ms (grey to grey)	6ms (grey to grey)	5ms (unspecified)	5ms	2ms (grey to grey)
Brightness	300cd/m²	300cd/m²	400cd/m²	400cd/m²	400cd/m²	300cd/m2	300cd/m2
Dynamic contrast ratio	20,000:1	40,000:1	3,000:1	Unspecified	10,000:1	20,000:1	20,000:1
Horizontal viewing angle	170	170	178	178	170	170	170
Vertical viewing angle	160	160	178	178	170	160	160
Display type	TN	TN	S-PVA	IPS	TN	TN	TN
Video connections							
DVI / D-SUB	Y / Y	Y / Y	2 / Y	Y / Y	Y / Y	Y / Y	Y / Y
HDMI	Y	Y	Y	Y	N	N	Y
Other inputs	N	N	Display port, S-Video, composite, cpmponant	Display port, S-Video, composite, cpmponant	N	N	N
Audio							
Inputs	Mini-Jack	N	HDMI	HDMI	N	N	Mini-Jack
Speakers	2x2W	N	N	N	N	N	2x2W
Headphone jack	Y	Y	Y	N	N	N	Y
In the box							
Cables	DVI, D-SUB, audio	D-SUB	DVI, D-SUB, HDMI, USB	DVI, D-SUB, HDMI, USB	DVI, D-SUB	DVI, D-SUB	DVI, D-SUB, audio

The quality score is a measure of the overall image quality as tested using the three tests described above (movies, games and everyday applications). The features score takes into account the adjustability of the stand, the number and type of inputs, the usefulness and user friendliness of the OSD (on screen display) and any extra features, such as USB ports.

The features score is also heavily influenced by the resolution of the monitor. Although we only tested 24in TFTs, some manufacturers have recently started selling 16:9 panels, which have a lower resolution than traditional 16:10 24in TFTs (1,920 x 1,080 as opposed to 1,920 x 1,200). This might not sound like many fewer pixels, but the point of using a large monitor is the ability to see more, so a 16:9 panel is a step backwards. As these monitor manufacturers are only producing 16:9 24in TFTs in an effort to save money (they have the same aspect ratio as HDTVs), we'd generally recommend a degree of scepticism about them.

The value score is an expression of the value for money of each monitor, and was calculated using a weighted ratio between the quality and features scores divided by the price. The overall score is a weighted combination of the quality, features and value scores.





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ViewSonic VX2433wm

Better used as a picture frame than a monitor, despite the price.

Street Price $379
Manufacturer www.viewsonic.com

As image quality is clearly the most important characteristic of a computer monitor, it's disappointing how many companies don't appear to place it at the top of their list for R&D.

This 16:9 ViewSonic monitor is a case in point. The glossy black plastic shell is great to look at it, but as soon as you turn on the screen, you want to look away. Although it has DVI, D-SUB and HDMI inputs, the viewing experience is ruined by the lack of sharpness and obvious colour banding.

For example, even the most basic challenge for a monitor – black text on a white background – is a challenge for the ViewSonic; text appears spidery, especially in the lower half of the screen. Ironically, this problem is eradicated if you view the screen from below, so ViewSonic would appear to have designed this monitor for PC users who are vertically challenged.

The Serenity trailer looked even worse – somebody passing through the lab thought we were watching a battered old VHS tape rather than a 1080p movie! The colour banding was so horrific that we couldn't face watching the two-minute trailer more than once, so how you're supposed to sit through an entire two-hour movie is beyond us.

Unbelievably, playing Crysis on the ViewSonic was an even more deeply unpleasant experience. There was so much colour banding across the screen that Crysis looked more like a collection of still images that had been badly stitched together in a panorama rather than an animated 3D scene. To add insult to injury, the colours were so lifeless, it appeared that the US Air Force had dumped a load of Agent Orange on the game's lush tropical islands, killing off all the vegetation.

Considering the ViewSonic's dire image quality, it's hard to see why you might buy one. As it has the less than ideal 16:9 aspect ratio and more faults than the Pacific Rim, the VX2433wm is best left to rust in ViewSonic's warehouse rather than being connected to a PC.

Overall
Lacking in just about every area a monitor should excel in.
37%

BenQ G2411HD

Cheap for a 24in monitor, but it has too many shortcomings.

Street Price $499
Manufacturer www.benq.com.au

Like the ViewSonic and Asus, the BenQ has an aspect ratio of 16:9 and a native resolution of 1,920 x 1,080. While it's cheaper than a traditional 16:10 monitor, you get noticeably less vertical screen area.

The BenQ is equipped with an HDMI input, but it also has D-SUB and DVI inputs. BenQ has decided not to include speakers with the G2411HD. The stand lacks the physical adjustability of the more expensive monitors, so you could find that those old issues of Atomic lying around might come in handy to lift it up to a more viewable height.

BenQ states a 2ms grey-to-grey response time for the G2411HD. We certainly can't argue with that, as Crysis was ghost-free and our input lag test saw no recordable latency compared with the control monitor. Performance in other departments was less impressive though.

Crysis appeared bland and uninspiring, although the colours weren't as bad as those of the ViewSonic. Text appeared to be slightly spidery and we also noticed it was much darker at the top of the screen. These faults were echoed in the Serenity trailer, in which the top half of the screen looked noticeably better than the bottom half. We also noticed a fair amount of colour banding, although less than can be found on many other monitors. Overall, the BenQ isn't anywhere near as bad as the ViewSonic, but we'd strongly suggest looking elsewhere for a monitor on which to play Blu-ray movies.

While its price tag of a fraction under $500 for a 24in monitor might seem tempting, we found the BenQ to be lacking in features and image quality, a familiar trend with many of the 16:9 monitors. This might seem harsh, but a monitor is something you'll be looking at whenever you use your PC, so it's crucial to buy the best monitor you can, and the BenQ clearly isn't such a screen.

Overall
A solid price cannot hide less than stellar quality.
61%

LG W2452V-PF

Good for games and the Web, but exhibits shockingly bad video playback.

Street Price $415
Manufacturer http://au.lge.com

LG's W2452V-PF ties for the second cheapest 1,920 x 1,200 capable monitor in this Labs test, retailing for $415. Unfortunately, the lower price doesn't translate into better value for money and it lacks many features we'd expect to find on a monitor for this price.

To start with there's no headphone jack or speakers, and while the screen can be pivoted, you can't adjust its height. While the LG is stated as having a response time of 5ms, one of the slowest on test, Crysis saw no noticeable ghosting. As the LG is a TN-based panel, there was no evidence of input lag compared to the control monitor.

We started with the everyday applications and to our surprise, the LG performed well. Text was displayed clearly and white pages were a true white, unlike the HP, which has a cream tinge. Crysis also looked good, with a little more depth to the colours than was seen on the other similarly priced monitors.

We then tried watching the Serenity trailer on the LG, and it was at this point that things started to go badly wrong. In fact, if the LG were possessed by Homer Simpson, it would cry out 'D'oh!' when playing movies. It was without doubt the worst monitor on test for video playback – blacks merged into hideous blobs that looked absolutely awful.

The Lagom image quality tests didn't yield any answers. The LG was able to show the level three square in the black level test, which is a decent result. We can only surmise that another force is at work here.

However, the LG is so bad at HD video playback that it actually *introduces* artefacts.

The LG lacks features such as height adjustment and audio connectivity, while its video playback test result was diabolical. The panel has the sensible 16:10 aspect ratio rather than the trendy new and less useful 16:9 aspect ratio, so if you need a large screen for word processing, web browsing and playing the odd game then it might be worth a look; but steer well clear of the LG if you watch videos on your PC.

Overall
Good for everything but watching high quality video playback.
61%

Samsung 2433BW

A mediocre 16:10 monitor with a cheap price.

Street Price $415
Manufacturer www.samsung.com.au

At first glance, you might think that this is just another lacklustre 16:9 monitor, but you'd be wrong. The Samsung is a full-fat 16:10 monitor with a native resolution of 1,920 x 1,200.

The Samsung is devoid of any kind of pivotal or vertical adjustment – it only has a tilt option. There are no speakers or headphone jacks, and it lacks an HDMI input. The stated brightness is also one of the lowest of all the monitors at just 300cd/m2.

The Samsung managed an acceptable performance in Crysis, although the colours were no match for the more expensive Dell, HP and NEC monitors. It's quoted 5ms response time seems to be realistic, as tearing isn't much of an issue and we couldn't measure any input lag, compared with our control monitor.

However we're concerned by the poor viewing angles; it appears that Samsung may have inadvertently created a monitor for the severely vertically challenged, or for those who like using their PC while sitting on the floor. Head on, it suffers from uneven brightness, which makes reading text awkward, but this is rectified when viewing text from below. Horizontal viewing angles are also poor, with a much better range to the right than to the left.

The Samsung did a poor job of displaying the Serenity trailer – several scenes were laughingly bad. The main culprit is the extremely limited black range. The Lagom black level test showed why: the entire top row of dark grey squares, level 1 through to 5, were invisible.

The Samsung simply can't match the image quality of the more expensive 16:10 monitors in this Labs test. But it does have a larger viewable area than that of any of the 16:9 monitors on test and doesn't fail miserably in any key areas – something that can't be said of the ViewSonic or LG. If you're on a tight budget then the SM2433BW could be worth a look.

Overall
A reasonable choice for the budget-concious user.
63%

Asus VW246H

The best of the 16:9 monitors, but it's no champ.

Street Price $369
Manufacturer www.asus.com.au

The Asus VW246H is one of the new generation of 1,920 x 1,080 24in TFTs and therefore has an aspect ratio of 16:9. This means that it can display 16:9 movies without black bars at the top and bottom of the screen, but games and Windows appear more cramped than on a standard 24in 16:10 TFT with a native resolution of 1,920 x 1,200.

Like all the cheaper 24in TFTs, the Asus has a TN panel, so its viewing angles are pretty poor. This means that if you want to watch movies on the Asus, you need to be viewing it head on to see the best picture. The stand can't be tilted, raised or lowered, so you'll need to prop up the Asus with something if your desk isn't high enough to attain the optimal viewing angle. There's a pair of weedy 2W integrated speakers, but you're far more likely to make use of the D-SUB, DVI and HDMI inputs. The OSD is easy to use, although it lacks several features such as gamma control.

The Asus displays text reasonably clearly, but we were unable to prevent background whites from appearing as a dirty grey instead of pristine white. While watching the Serenity trailer, we noted that other colours were also a little washed out – the panel clearly struggles with making one colour stand out from another. However, there was little banding in dark scenes, so we could see a fair amount of detail in the shadows.

Although the Asus was barely above average in the desktop apps and Serenity trailer, Crysis was quite enjoyable. In contrast to 'Serenity', in which many of the colours were washed out and lifeless, the Asus did a good job of distinguishing between the many greens of Crysis's varied and rich foliage.

While the Asus stands head and shoulders above the other TN panels in this Labs test, its image quality is still considerably poorer than that of the superior Dell, HP and NEC monitors. If Asus produces a 16:10 model with similar image quality at the same low price, it could be worth considering, but until then, like all 16:9 monitors, this Asus monitor isn't worth buying.

Overall
A solid enough performer on its own, but too small in this class.
73%

Dell 2408WFP

One of the better 24in monitors, but it's no longer king.

Street Price $989
Manufacturer www.dell.com.au

Dell may have failed to produce a desirable gaming PC, but its monitors – in particular, its range of 24in TFTs – remain very popular among PC enthusiasts.

This 16:10 monitor with its native resolution of 1,920 x 1,200 is getting on a little, having first hit the market in mid-2008. Unlike many of the monitors in this Labs test, the stand's height can be adjusted, which is essential for ideally positioning the monitor for your eyes. It can even be swivelled into portrait mode.

Alongside the two DVI inputs, you can also find D-SUB and HDMI inputs, four USB2 ports, a media card reader and a comprehensive selection of analogue video inputs. If you can find a device you can't connect to the Dell then you need to get out more.

The S-PVA panel guarantees a good range of viewing angles, although the backlight of our sample was rather uneven, with the left side of the screen being significantly brighter than the right. The 2408WFP we tested previously didn't suffer from this problem, but as this new sample came from a retailer, it's worrying to think that even a handful of 2408WFPs have an uneven backlight. Even so, the Dell proved to be one of the best monitors in this Labs test, with text standing out clearly from a clean white background in Windows.

The Dell wasn't quite as impressive when playing the Serenity trailer, but it was still one of the better monitors. Although there was very little colour banding, the uneven backlight meant that dark scenes and shadows on the left side of the screen lacked detail.

Crysis was far more enjoyable, with a good contrast between colours. However, as Dell has overdriven the S-PVA panel hard, it suffers from a noticeable amount of input lag – 31ms according to our measurements. This is quite off-putting if you play twitch-reaction first-person shooters such as Counter Strike, although it's less noticeable in other games.

Ultimately though, the Dell is outshone by the incredibly vibrant HP LP2475w, which also happens to be cheaper.

Overall
After so long on top, Dell finally loses the the race...
85%

HP LP2475w

Simply stunning in games and videos.

Street Price $1159
Manufacturer www.hp.com

A monitor should be a long-term investment. With this fact in mind, how much money you spend depends on your budget, but if you're after a 24in monitor with a 16:10 aspect ratio, it's well worth forking out some serious cash for a monitor that you can happily use for years to come. The HP LP2475w certainly meets the latter criteria – it costs nearly $1200 and it's bright, vivid and sharp.

As you'd expect with a monitor at this price, the stand is fully adjustable, including pivot and height adjustment options. It also has the greatest degree of tilt available, too – up to thirty degrees upwards and five degrees downwards. The HP is also awash with video inputs. In addition to the usual DVI, D-SUB and HDMI ports, there's a DisplayPort, S-Video, and even composite and component. However, it lacks speakers and or a headphone jack.

The OSD is relatively easy to navigate, but there's no gamma adjustment or preset modes, both of which are available on the HP's most closely priced rival, the Dell. However, the Dell lacks the colour temperature adjustment sported by the HP.

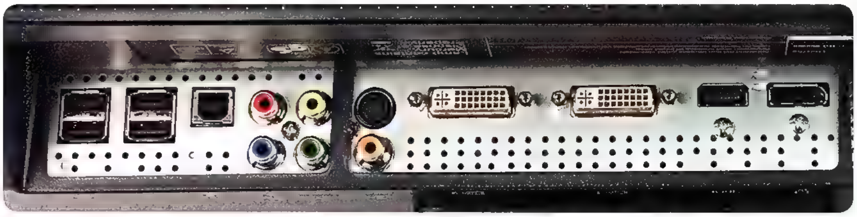
Both the Dell and the HP monitors have a stated grey-to-grey response time of 6ms, but despite this time being the highest of all the monitors on test, Crysis was ghost-free and a pleasure to play on both monitors. In fact, we'd go one step further with the HP and say that Crysis looked absolutely fantastic. Despite running at identical settings to those of all the other 16:10 monitors, Crysis looked like a different game, with lush and vibrant surroundings. Even the background foliage was composed of countless shades of leafy greens and dark shadows that had us in awe for the first few minutes as we gazed at the depth of colour on display.

However, we noticed some input lag from the HP's IPS panel. This was confirmed in our input lag test, which showed that the HP lagged behind our control monitor by 31ms, the same amount as the Dell. However, the effect was slight and we became used to it after a few minutes of gaming. Even if you're a hardcore online first-person shooter fan and your favourite games include titles such as Modern Combat or Unreal Tournament 3, it's unlikely that performance will be hindered. We'd also argue that it's a worthwhile compromise for the stunning graphics of the HP. The NEC was nearly as good in Crysis and showed no input lag, but it's more expensive and, apart from its superb sharpness, the lack of input lag was its only advantage.

The Serenity trailer was equally impressive, with lots of contrast and very little evidence of banding in the darker scenes. In fact, the HP looked even better than the NEC!

The HP is also noticeably more adept at video playback than the Dell. If your PC has a Blu-ray drive and an HDCP-compliant graphics card, the HP is the perfect partner for them.

We then moved on to assess how the HP fared in general usage. Strangely, this isn't a task at which it excelled. Despite the colour and clarity bonanza displayed in Crysis, we saw a strange rainbow effect surrounding black text on a white background, although it was only noticeable when viewing the screen close up from a distance of around 18in or less. We also found that white backgrounds in word documents and web pages were a touch murky instead of pristine white.



Overall
Our number one choice for serious monitor real estate.
90%

Conclusion

TFT monitor technology has improved enormously in recent years. Many monitors are now ghost-free, have great colour reproduction and don't need you to take out a second mortgage to buy.

However, you get what you pay for. The Asus is a good example of a solidly performing 24in TFT that can be bought for less than $400, but it's far less capable and has a lower native resolution than the HP. For most of us, a monitor is something we won't regularly upgrade and may sit on our desks for several years.

Considering the amount of time you'll spend looking at the screen, buying a good-quality monitor is essential and the HP's $1200 price tag isn't as crazy as it first seems. Unless you're really sensitive to input lag, for gaming and video playback, the HP is unbeatable and well worth its asking price.

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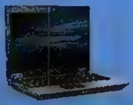

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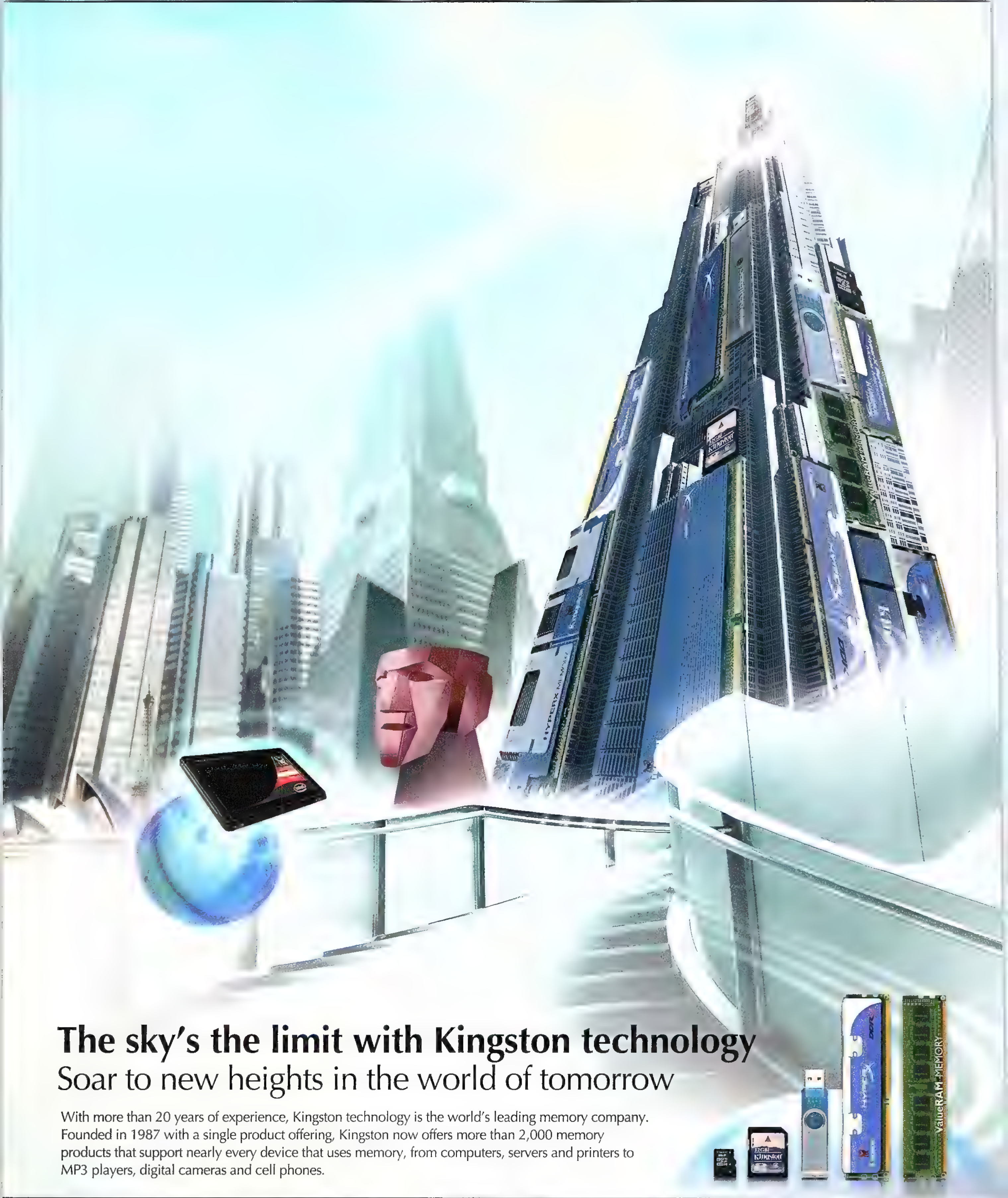

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In tonight's episode of Fallout 4...

Daniel Rutter gets his game on, and on, and on...

You know what's wrong with episodic gaming? It's just not episodic enough.

The first kind of episodic gaming was expansion packs and sequels. They're like movie sequels; usually full-sized and full-priced, and they don't come out very often. Three Fallout games took 11 years; Quakes 1 through 4 took nine years.

Sometimes there are quite a lot of expansions and sequels, especially with series like the various Battlefields, the Ultima games, and the interminable series of EA sport games. They're like a long movie series, and they're not what I'm looking for.

Now we've got explicitly episodic games – relatively small and cheap chunks of game, released in sequence to complete a story in not very many instalments. They're like a TV miniseries, and they're closer to what I want, but still pretty far away.

What I'm waiting for is episodic games that work like regular TV series, going on and on with no definite end in sight...

What I'm waiting for is episodic games that work like regular TV series, going on and on with no definite end in sight – or, at least, with a planned end that's some years and many, many episodes away. We've got the framework for them already; it's just currently supporting different kinds of games.

Now that MMORPGs with monthly fees are big business, they can pay for constant expansion of the game world. World of Warcraft and City of Heroes are five years old now, but only in the same way that Law & Order is 19 and Neighbours is 24. Current players get a game that's the same as the original in basic concept, and they can play the original parts of it more or less unchanged if they want to, but there's far more stuff to do now than there was when the game was new.

What I'd like to see is an open-world game – a Grand Theft Auto, Fallout or Oblivion – that has new stuff for you to do every few days, or even daily. Just click a 'What's New?' button, and the auto-updater checks and tells you that crooked cops are collecting a big shipment of something down at the docks, or a herd of zombie elephants has been sighted to the north, or whatever, and would you like to have a look? If you would, the new stuff downloads and away you go.

At the moment, you only really see things like this in the MMORPGs, and the new content tends to come in big lumps – expansion packs. Day-to-day changes are more likely to be minor power and difficulty adjustments, and people who'd rather play a single-player game are left out in the cold entirely, except for periodic bugfixes, if they're lucky. But there's no reason at all why add-on content should only be available in games that have thousands of people sharing a server.

One way to help this happen would be user-created content. That's been around for a long time – about half of the Duke Nukem 3D user base seemed to be making levels for the game, and some of us even remember user-made Lode Runner levels – and there are lots of games today with free world-making tools.

No teenager in his bedroom is going to create a whole new city for an open-world game like GTA IV, of course, but just look at the dozens of Total Conversions for 3D games out there. A mod-friendly open-world game with a Metacafe-style reward system for people who make popular new content could have cool new stuff popping up by the hour.

New content wouldn't necessarily have to be whole clearly-defined missions, either. People could just design a new non-player character, using a CoH/Champions-Online sort of editor, and provide their own voice-acting. Most of them would stink, of course, but that's where the quality-voting system comes in. You could just walk around 'interviewing' new peds!

You know when you walk out of a great movie, and you're sad that it had to end? Games don't have to.

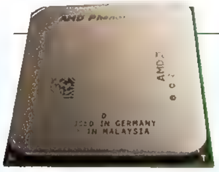
Dan Rutter also doesnt have to end.
dan@atomicmpc.com.au

KITLOG

There's nothing sexier than new kit. And whether you need to hoard your pennies (Budget), want the most power for your dollar (Performance) or own a small mansion and a collection of sports cars (Extreme), we're here to help with this handy matrix of Atomic recommended products. You may find your needs fall between categories – that's okay, just mix and match to suit your budget! Each piece of kit has been reviewed hands-on in Atomic, so if you want to learn more, look up the issue and page number listed.

BUDGET

CPU

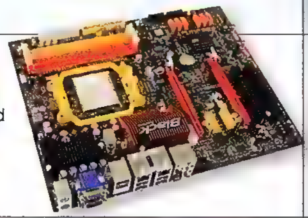


AMD Phenom X4 9550

PRICE $200

A well performing Quad core for those on a budget, that won't break the bank and doesn't get too hot.

MOTHERBOARD



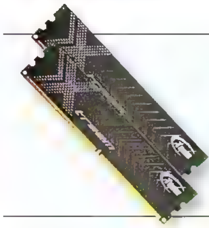
ECS A790GXM-A

PRICE $200

Nothing says cool like a black mobo, and this one will satisfy your overclocking needs too.

Reviewed in Issue 99

MEMORY



TEAM Xtreem Dark PC2-6400 C4

PRICE $60

These modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.

Reviewed in Issue 80 – Page 56

VIDEO CARD

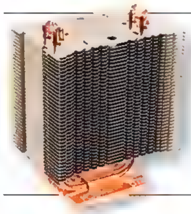
XFX 4770

PRICE $155

The first 40nm desktop card, that not only overclocks amazingly but is also incredibly cheap.

Reviewed in Issue 102 – Page 41

COOLER



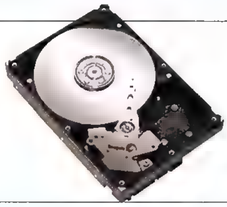
Noctua NH-U9B

PRICE $72

Labs tested to be the top of the cooling game without breaking the bank (or making you sweat – haha)

Reviewed in Issue 89 – Page 36

SYSTEM DRIVE



640GB HDD

PRICE $110

The absolute best value for money, with two 320GB platters giving great speed and low latency.

DISPLAY

AOC 2216Vw

PRICE $240

A great 22" widescreen for any purpose, with accurate colour reproduction and a bloody good price.

Reviewed in Issue 94 – Page 42

SPEAKERS

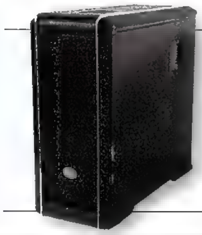
Plantronics Gamecom 777

PRICE $94

This set of headphones is built like a brick, sounds like a harp and doesn't cost a bomb.

Reviewed in Issue 101 - Page 41

CASE



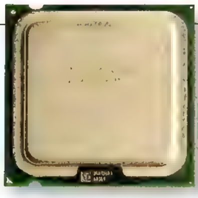
Cooler Master CM690

PRICE $100

A sturdy, spacious case with plenty of airflow and more than enough room for the biggest of systems. Some stores even have a windowed version!

Reviewed in Issue 84 – Page 51

PERFORMANCE

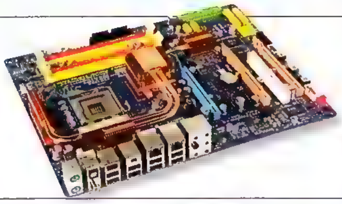


Intel Core 2 Duo E8400

PRICE $270

A processing powerhouse, now affordable and overclockable like buggery.

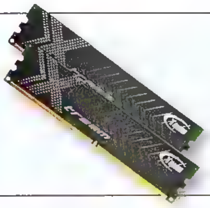
GIGABYTE EP45-DS4P



PRICE $200

A P45-based mobo with a bevy of features and a good overclocking potential.

Reviewed in Issue 93 – Page 55



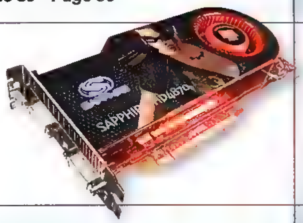
TEAM Xtreem Dark PC2-6400 C4

PRICE $60

Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.

Reviewed in Issue 80 – Page 56

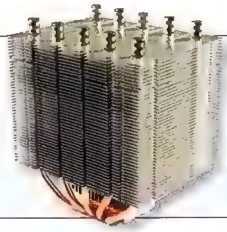
Sapphire HD4870



PRICE $350

One of the best price to performance cards on the market. Welcome back Red!

Reviewed in Issue 92 – Page 36



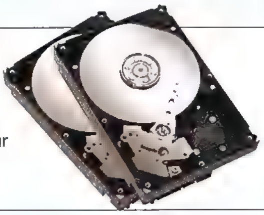
Scythe Mugen 2

PRICE $84

The Mugen 2 performs almost as well as the TRUE, but has a fan included and is even a little cheaper!

Reviewed in Issue 100 – Page 42

640GB HDD - Times two!



PRICE $110x2

All the speed of dense platters, with the peace of mind to be able to back up your precious files.

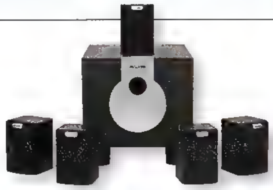
LG W2252TQ

PRICE $270

You'll pay a little more for this 22" screen, but the colours are amazing, with no backlight bleed and no ghosting.

Reviewed in Issue 94

AVLabs AVL325



PRICE $210

Slightly aged speakers now, but these still offer a great 5.1 sound experience - if you can find a set.

Reviewed in Issue 64 – Page 50

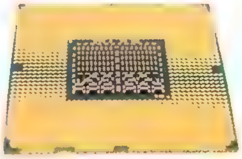
Cooler Master HAF 932

PRICE $230

A massive case with three 230mm fans that can move enough air to qualify as a small aeroplane. And quiet to boot.

Reviewed in Issue 93 – Page 48

EXTREME



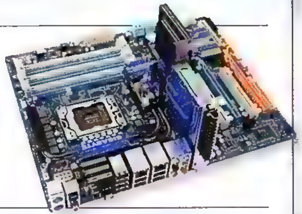
Intel Core i7 975

PRICE: $1695

Intel's latest and greatest chip, complete with an unlocked multi, 45nm process, and a massive pricetag. Good for what ails you.

Reviewed in Issue 102 – Page 36

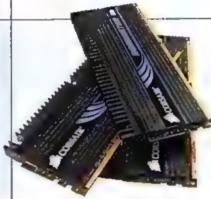
GIGABYTE EX58-EXTREME



PRICE $520

GIGABYTE has had the best overclocking board thus far, and therefore the perfect mobo for a beastly rig.

Reviewed in Issue 96 – Page 38



Corsair Dominator TR3X6G1600C8D

PRICE $515

Nothing says memory bandwidth like a triple channel kit of speedy, yet imposing RAM - a whole 6GB of it!

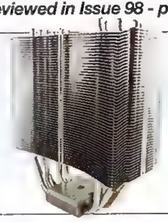
Reviewed in Issue 96 – Page 41

NVIDIA GTX295x2

PRICE $830 x2

NVIDIA catapulted themselves back to the top with this dual-GPU sandwich. Grab two of them in SLI for four-way madness!

Reviewed in Issue 98 - page 41



Thermalright Ultra 120 Extreme

PRICE $85

The current best air cooling - just make sure you grab a LGA1366 mounting kit to use it!

Reviewed in Issue 89 – Page 33

Intel 80GB SSD

PRICE $760

Blindingly fast, effortlessly quick, and uttely silent. Grab a normal HDD for storage, but games and OS need to live here.

Reviewed in Issue 94 – Page 50

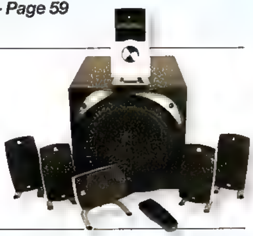
Dell 3008 WFP

PRICE $2299

It's enough to make a grown man weep and beg. Or, at least, that's what we'd do for one of these simply gorgeous displays.

Reviewed in Issue 88 – Page 59

Logitech Z-5500D



PRICE $419

Able to play the 'liquid gold' that is DTS 96KHz/24-bit, this 5.1 beast can wreck both home and hearing alike.

Reviewed in Issue 48 – Page 56

Lian Li X-2000

PRICE $740

The only case we've had in that has made the editor orgasmically happy, and is drenched with quality in every one of it's brushed aluminium panels. Definitely a case to show off your system-building prowess!

Reviewed in Issue 91 – Page 54

SUBSCRIBE

HERE'S WHAT YOU MISSED IN THE LAST ISSUE

SPECIALFEATURE

Chilled to the bone

James Gorbold and Antony Leather chill out with some cool heatsink and fan combos.

GAMEPLAY ENGINE ROOM

Do I get to kill Hitler?

We know that everybody loves the chance to kill a virtual Hitler, so let's get it out of the way right here. No, he doesn't make an appearance this time around. id tells us you can shoot up paintings of the Fuhrer all you like, but for this story it doesn't make sense for him to pop up in the game. Next time, Adolf, next time...

SPECIALFEATURE

MMOs: Stairway to Heaven, Road to Hell

Stuart Andrews ponders why so many MMOs fail, and what it might take to beat World of Warcraft.

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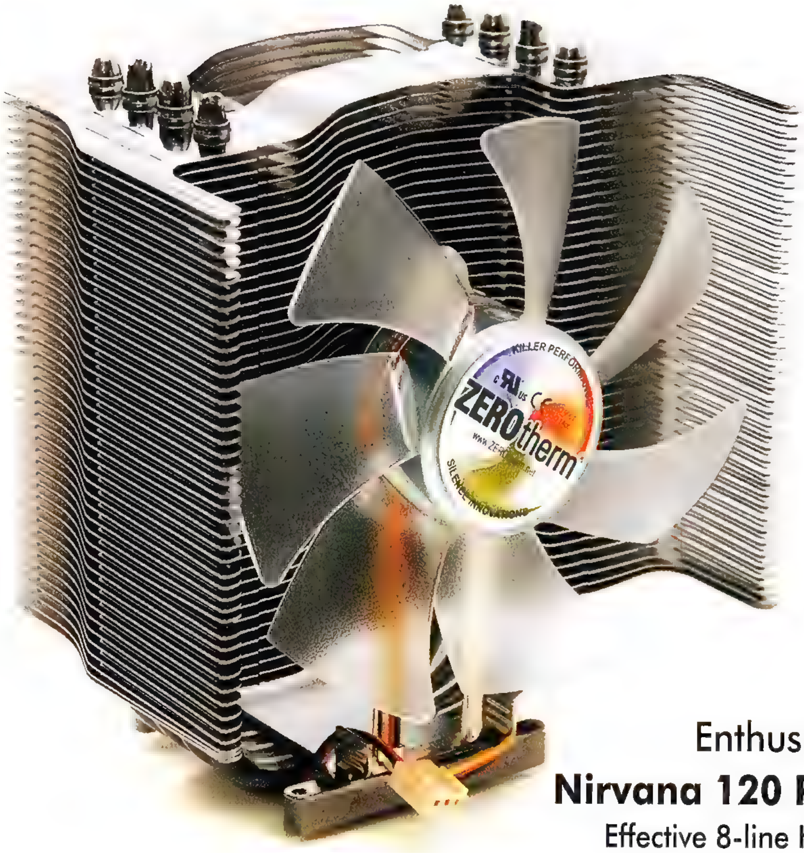

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TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

We've only got the one tute this issue, but it's a big one.

We're beating the living daylights out of an iMac.

No, not with the a sledgehammer (though that would be fun), but with a custom-built PC designed to deliver the best in Apple-style design, while packed with burning PC power. The challenge we've set ourselves is to build a bigger, better, faster and more stylish machine than an iMac, and for the same money. Who comes out on top?

Read on to find out.

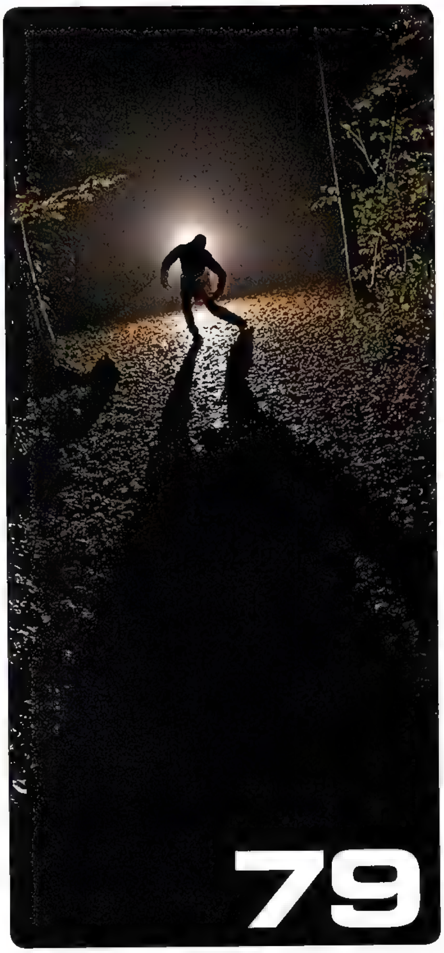
We've also got the latest educational advice from Chris Taylor, and handy hints and tips from Zara Baxter on how to survive the inevitable zombie apocalypse. Or any other disaster, for that matter. It could be the most important column you read all year...

TUTORIAL CONTENTS

Build a MAC KILLER 68
Our guide to choosing the parts and then building a true Anti-Mac, with full test results!

Atomic.edu 76
Chris Taylor brings the job smarts.

Geec Chic 79
Brains? Braaaaiiinnssssssss!



Make a Mac killer

Apple is winning; the iPhone is the sexiest gadget you can buy, Apple's computers are gobbling market shares like Pacman eats pills and Sydney's Apple store is thronging with eager customers. Can anything halt the march of the Mac? **Mark Mackay** and **Alex Watson** pit their wits against the Jobs Mob and try to build a PC that's quieter, faster and better than any iMac.

Since the release of the original iMac in 1999, Apple has steadily refined its desktop machine into a ludicrously attractive and shiny slice of aluminium and glass. And people don't only like the look of the hardware: from iTunes to its OS X operating system, Apple's software is powerful and intuitive. Buoyed by the iPod and iPhone, Apple is one of the strongest brands in the world. Not only has Apple been delivering, but its rivals have slipped up. Windows Vista was, at launch at least, slow and full of meddlesome touches and pointless changes. PC manufacturers had raced each other to the bottom to make the cheapest computers possible.

Macs are certainly desirable, but there's a price to pay – buying the cheapest iMac will leave you with just a single dollar of change from $2,000. Mac fans argue that while the initial price is high, you receive a lot with a Mac – Macs include movie, audio and image editing software as well as OS X. There's also the sense of satisfaction from owning a well-designed piece of kit.

Indeed, Apple has never sold its Macs based on how much horsepower you're gaining for your hard-earned cash. As a result, it's fairly easy to build a PC that's cheaper and faster than an iMac, but it probably wouldn't be as sexy and quiet, and have the same desirability factor. We decided to see if it's possible to beat the latest and greatest 24in iMac at its own game, and set ourselves the challenge of beating it, hands down, on as many fronts as possible, for the same price or less. We wanted to build a PC that was better-looking, quieter and more desirable than the iMac, and all for less cash. To win, we couldn't build any old performance system, but a beautifully crafted machine hand-made from selected hardware that directly competes with the strengths of the iMac.

You might call it... the *AtoMac*.

Know your enemy

To make the challenge a satisfying experience, we decided to pit our wits against Apple's latest 24in iMac. It's currently available in two baseline hardware configurations, with either a 2.93GHz Core 2 Duo or a 3.06GHz model. Our test machine featured the 2.93GHz CPU, along with 4GB of RAM, a 640GB hard disk, 8x DVD writer and an Nvidia GeForce GT 120 graphics card. There's also built in WiFi, Bluetooth, Gigabit Ethernet, a webcam and speakers. Apple includes a keyboard and mouse, and the 24in screen has a native resolution of 1,920 x 1,200.

The total cost of this is $2,999 from the Apple Store (**www.apple.com.au**).

HOW TO CHOOSE MAC-KILLING HARDWARE

Chassis

SilverStone Lascala LC13, $180,WWW.PCMARKET.COM.AU

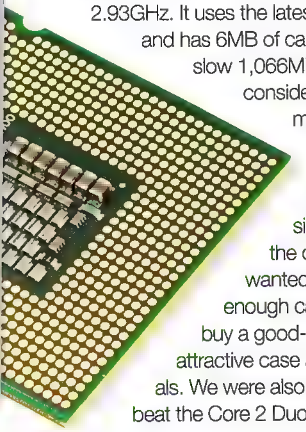
Undoubtedly the most difficult area in which to compete with the iMac is aesthetics; this is largely due to the Mac combining the screen and computer in one sleek case. Not only does using one tidy iPackage enable it to require less iSpace than a traditional PC plus monitor, but the iMac's smart, swooping aluminium stand and bezel is also considerably better-looking than pretty much every flat-panel display on the market.

Apple is able to fit all its components into the monitor housing, as it tends to opt for lower voltage laptop-spec kit, and can also have custom-manufactured components built to spec. We don't have that option (yet!), so we had to accept that a self-built PC would comprise a separate case and screen. That said, we weren't about to accept ugliness or chunkiness in our Mac killer.

We opted for a case made by SilverStone, which is a company we've long admired for its cases' minimalist design and unyielding aluminium build quality. A tower case such as Antec's Twelve Hundred might provide more in the way of raw cooling power, but SilverStone's Lascala LC13 media PC chassis is much more in line with the unobtrusive look the iMac boasts.

CPU

Intel Core 2 Duo E8400, $235, WWW.MSY.COM.AU



The iMac features an Intel Core 2 Duo T9800, which is a mobile CPU, with a stock speed of 2.93GHz. It uses the latest 45nm Penryn core and has 6MB of cache, but a relatively slow 1,066MHz FSB. While we considered building a Core i7 machine, we ultimately decided against this. Intel's new CPUs are fast, but would significantly increase the cost of the build. We wanted to make sure we had enough cash in our budget to buy a good-quality monitor, an attractive case and quality peripherals. We were also sure we could still beat the Core 2 Duo T9800 using a Core 2 CPU, so we opted for the E8400. It's a 45nm CPU with the same 6MB of cache, but a faster 3GHz clock speed and a 1,333MHz FSB. With a decent motherboard, it can also be overclocked in excess of 4.4GHz.

Motherboard

Biostar TP45 HP, $150, EBAY

The iMac uses a proprietary motherboard based on Nvidia's MCP79 chipset. The SilverStone LC13 can accommodate a full ATX motherboard, which means that we can pick one of the many affordable and highly overclockable motherboards on the market. We settled on the Atomic-approved but budget-friendly Biostar TP45 HP (see Issue 101's Head2Head). It's a P45-based, LGA775 motherboard which not only holds delicious connotations of tasty brown sauce, but also a very capable overclocker – in our testing, it hit a massive 530MHz FSB. It's hard to get at a store these days, but can be sourced with a bit of footwork. And it's worth the footwork!

Memory

4GB Corsair TwinX PC2-6400, $110,WWW.LIVEFIRE.COM.AU

As standard, the 24in iMac has 4GB of DDR3 memory running at 1,066MHz. This places us a step behind the iMac, as our chosen Biostar motherboard is a DDR2 model. However, our board would run at a faster frequency (1,333MHz), and we have enough collective experience to know that memory speed is one of the lesser contributors to overall performance, so we were happy to be the underdogs in this department. We opted for 4GB of Corsair TwinX PC2-6400 DDR2. We also know that with some overclocking, we can improve on the 800MHz speed of this bargain memory.

The memory is in the form of two 2GB DIMMs, leaving two memory slots on the motherboard free for more to be added in future. The iMac uses laptop SODIMM memory, and has two slots. While it supports up to 8GB of memory, both of our machine's SODIMM slots were filled with a 2GB module.

Hard Disk

750GB Samsung SpinPoint F1 HD753LJ, $110 FROM WWW.MWAVE.COM.AU

We were tempted to follow suit with Apple's choice of a solid 640GB Western Digital Caviar Blue, but decided on something slightly bigger, so we instead went for Samsung's SpinPoint F1, in its 750GB incarnation. This disk is 110GB larger than the Western Digital, and although you can pay a bit extra for a 1TB drive when buying your iMac, upgrading it yourself isn't possible. The Western Digital is marginally quicker than the Samsung, with an average access time of 12.5ms compared to the Samsung's 13.6ms. The Samsung's average read time is also slower, but it was faster in our quick batch of game level loading tests, and comparable elsewhere.

Graphics

GIGABYTE RADEON HD4870, 1GB, $249, WWW.PCCASEGEAR.COM.AU

While Apple has the advantage in the sleek looks department, the PC has the advantage when it comes to gaming power. The iMac's laptop origins might restrict CPU choice (you can't, for instance, buy a quad-core iMac, as Intel makes no low-voltage laptop quad-core CPUs) but GPU choice is where Apple's machine really suffers. The GT 120 is better known as the lowly GeForce 9500GT with 256MB of 600MHz (1.2GHz effective) memory, and a 64-bit memory interface and 32 stream processors. There's no way this card will be able to game at the native resolution of the iMac's 24in screen, and you should take the Apple website's description of it as 'Ultrafast NVIDIA graphics' with not so much a pinch of salt, but the contents of a Hercules C-130. When buying your iMac, you can upgrade the graphics, but the best you can use is a Radeon HD 4850, and this will cost you a lot more than if you were to buy the desktop version of a card from a retailer.

While we were confident that we could easily trump the Apple machine in terms of graphics power, we wanted to be aware of noise levels. The iMac's mobile GPU has a trump card here, which is the amount of noise its miniature cooler produces. For this reason, we opted for the 1GB version of Gigabyte's reasonably quiet Radeon HD 4870 (see issue 97). This card has dropped in price considerably since we saw it a few months ago, and it will bring solid performance figures and pretty good decibel levels to our iMac killer.

Display

HP LP2475W, $925,WWW.MWAVE.COM.AU

Apple is quite conservative with the specification of the iMac display on its website; whether this is out of embarrassment due to the quality of the panel or an attempt to keep the website free of

numerical clutter is hard to say. It states the contrast ratio of the 24in iMac display as being 750:1, 25 per cent less than the 1000:1 contrast ratio of the Head2-Head-winning 24in HP LP2475 (see p50) that we've enlisted for the job. As mentioned previously, selecting a display as physically attractive as that of the iMac is practically impossible; instead, we chose a display proven to be capable of producing stunning visual gorgeousness.

Peripherals

Logitech G9 Gaming Mouse, $129,WWW.SCORPTECH.COM.AU

Hiper HKB-B01 Aluminium keyboard, $69, WWW.PCCASEGEAR.COM.AU

It's easy to indulge in iMac bashing in the peripherals department. The primary problem for most PC users is that the iMac's mouse physically has one button (although it has two sensors, so it can right click), and a shape that's more pleasing to the eye than the hand. Two-buttoned mice are abundant on the market, although few are as comfortable or functional as Logitech's awesome G9.

Similarly, there's a myriad of gaming keyboards currently on the market, although many of them are either gimmicky or downright ugly. In a bid to continue the smooth and sleek theme started by the SilverStone LC13, we opted for HiperPower's Aluminium keyboard. Much like the iMac's keyboard, it's slim and features low-profile keys in addition a brushed aluminium finish. The Hiper has a numberpad that Apple has decided to dispense with altogether on its iMac keyboard.

Cooling

120mm Noctua NF-S12-800 case fan, $29,WWW.STORMCOMPUTERS.COM.AU

2 x 80mm Noctua NF-R8 case fan, $27,WWW.MWAVE.COM.AU

XSPC Delta V3 CPU waterblock, $82WWW.RADIICAL.COM.AU

4m Radiical Tubing 3/8in ID, 1/2in OD, $34, WWW.RADIICAL.COM.AU

2m Helicoil Tubing anti-kink coils, $15,WWW.RADIICAL.COM.AU

6 x Bitspower 3/8in ID, 1/2in OD compression fittings, $57, WWW.RADIICAL.COM.AU

XSPC bay reservoir with pump, £26.44 ($54 APPROX) FROM WWW.SCAN.CO.UK

XSPC RX120 radiator, $94,WWW.RADIICAL.COM.AU

The iMac uses a low-voltage laptop CPU and GPU, as well as DDR3, all of which lower the heat that its cooling system has to cope with. Air is drawn in via vents on the underside of the screen bezel, and exhausted from a large air vent slot at the top of the rear casing; this system results in a very quiet machine. We're keen to make our PC just as well behaved, and having avoided Core i7 and a ludicrously pricey graphics card, we had some budget left to play with. In addition, we wanted to give our Mac killer a degree of the iMac's desirability and cool factor. Now, what we consider to be cool might not be to everyone's taste, but as far as we're concerned, water-cooling a small system will result in a machine that's sleek, silent and very cool. We also decided to replace the fans included with the LC13 and install Noctua models, as they're extremely quiet.

After measuring the case, we realised that we could mount a single 120mm fan radiator on the side, so we opted for XSPC's RX120 radiator, matched by the Delta V3 CPU waterblock, as the V2 model has tested well. We opted for compression fittings for the tubing, as they're easy to fit, and also very tidy. Finally, the LC13 has two 5.25in external drive bays and, with only one filled by our DVD writer, we saw an opportunity to install a bay reservoir. XSPC's bay reservoir not only looks cool, but also contains a small pump. It's compact and will be fine for a system in which only one component is water-cooled. Sadly, it's rarer than hen's teeth in this hemisphere, so we've had to look a little further afield – but we're aiming for perfection, right? Given the space this unit saves we consider it an essential part of the build.

Other components

Creative SoundBlaster X-Fi Xtreme Gamer, $124, FROM WWW.PCCASEGEAR.COM.AU

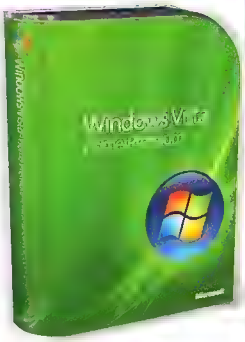
Sony/NEC Optiarc AD-7200A-0B DVD writer, $57, FROM WWW.BETTERCOMPUTERS.COM.AU

Amacrox Free Style 750W $230, WWW.MWAVE.COM.AU

The iMac uses on-board Intel HD audio to provide sound, and while our system's Biostar motherboard also features this, we opted instead for an upgrade. Creative's SoundBlaster X-Fi Xtreme Gamer features the X-Fi chip for enhancing MP3 playback, and also adds a wider range of connections to the system. As well as housing a standard ATX motherboard, the SilverStone LC13 case can also accommodate a full-sized ATX PSU. We turned to the Amacrox Free Style, a 750W PSU that's also modular, which enables us to cut down on clutter inside the case. Finally, we added a Sony/NEC Optiarc AD-7200A-0B DVD writer, which can write single-layer DVDs at 2x, faster than the iMac's 8x burner.

Operating System

Microsoft Windows Vista Home Premium SP1 64bit, $139,www.msy.com.au

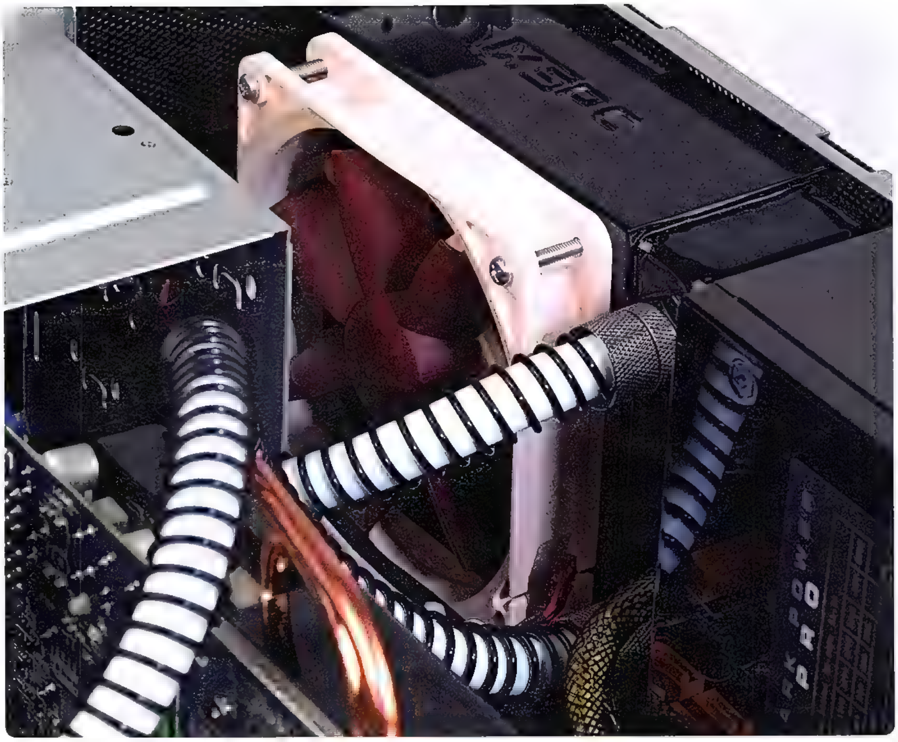


The iMac includes the latest version of OS X 10.5 pre-installed. A newer version, codenamed Snow Leopard, is currently in BETA and is expected to be released before the end of the year. Significant updates to OS X are paid upgrades; currently 10.5 costs about $130, so it's reasonable to expect that Snow Leopard will cost a similar amount. We opted to install Windows Vista on our Mac Killer. It's been a divisive OS since its launch, but while we considered Linux, we wanted access to Windows' library of software, including games. We're also conscious of the fact that the 180+majority of people looking at an iMac are likely to be interested in popular mainstream apps such as Photoshop and Office, which are Windows-only. Like Apple, Microsoft has an updated version of its OS due for release before the end of the year. Arguably, Windows 7 is a more important update than Snow Leopard, if only because Vista has been disappointing.

TIPS FOR THE BUILD

While many people trooping into the Apple store are attracted by the convenience factor of the iMac, you wouldn't be reading a magazine such as Atomic if you thought that building a PC was a chore. Opening a big box of the perfect mix of components ready to be assembled is a great moment. We began our build by gutting the inside of our SilverStone LC13 chassis, and removing the front panel connectors, drive bays and stock fans. This was especially important in this build, as we wanted to water-cool the system, and a visit to the chop-shop would be necessary. Unfortunately, Atomic HQ doesn't have a fully outfitted chop-shop, so we had to make do with our gaming space.

Taking a Dremel to a beautifully crafted, brand-new case can be a nerve-wracking experience, but with some patience and double-checking, you'll be ready to go. Before we started slicing, we experimented with laying out the water-cooling system inside the case. We knew that the reservoir would be housed in one of the 5.25in drive bays, and the radiator and its single 120mm



fan located on the side of the case. It was clear that we wouldn't be able to fit the radiator near the CPU, so it had to go on the other side of the case, near the PSU. Once we'd found an ideal location for the radiator, we covered the outside of the case with masking tape, which provides an ideal surface for noting measurements, in addition to limiting splinters and metal dust.

The Dremel's heavy-duty cut-off blade is great for cutting steel and we needed around three of these to complete the job. Make sure that you wear protective gloves and goggles when undertaking this kind of work: steel dust is a nasty thing to get on your skin or in your eyes.

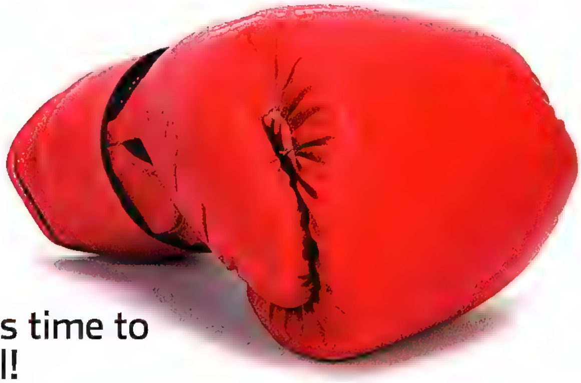
Once the hole was cut, we filed down the edges, so they were smooth, and then fitted a perforated metal cover. The material we used to cover the blowhole is available at most good DIY stores for a few pounds, and is usually bought in 1/2m squares. To secure it to the side of the case, we used industrial-strength double-sided adhesive foam tape.

We then installed the CPU, memory and a basic HSF in the motherboard on the workbench and quickly tested it to check that it all worked. With this test passed, we then fitted the waterblock to the CPU, and began work on the loop. Installation wasn't too tricky, thanks to the fact that we only used one block, and a combined reservoir and pump, along with compression fittings. We then filled and leak-tested the loop, and installed it in the case. To secure the radiator and fan to the side of the case, we used more double-sided adhesive foam tape, but secured the radiator to the bottom of the case, rather than the side.

With the loop installed and leak-tested, we could start adding in the other hardware and managing the cables. The internal 3.5in bays made an ideal space to tuck away both the excess power cable from the graphics card and the excess tubing that had to be routed around the graphics card in order to attach the lid of the chassis.

The base of the LC13 is also the motherboard tray. As the spacer bolts are screwed into raised bumps on the bottom of the case, there's a good-sized gap underneath the motherboard. This space can be used to unobtrusively route cables to their respective connectors, which is handy, as there isn't a great deal of space to work with once you start adding components.

A general tip for cabling a PC such as this is to make sure that you don't cross over the cables, as this would result in them being double-decked and unable to fit underneath the motherboard. If this happens, the solder points under the PCB can push through the insulation of the cable and come into contact with the metal. This can potentially result in small explosions, dead motherboards, the opening of interdimensional gateways and other unpleasant experiences. After the final cables were tidied away, we were left with a suitably attractive PC with which to commence battle against the iMac - read on!



The Fight

We've talked the talk and built the PC – it's time to see how our creation fares against its rival!

SETUP

WINNER iMac

As we're Atomic MPC magazine and not Atomic, um, MM (huh?), you might think we're going to be biased against the iMac. However, we're in favour of fair and accurate testing, and we're also not completely immune to the stern aesthetic charms of the iMac. When it comes to setup, we'd love to write about the laborious task of opening the iMac's packaging, the gruelling task of plugging in the keyboard and mouse, and the utterly exhausting process of hitting the power button. However, we must, in the pursuit of objectivity, concede that this isn't the case. Setting up the iMac is easier than making a slice of toast and probably takes less time.

In almost impossibly stark contrast, our PC required some case modification, testing to make sure everything is working, water-cooling loop assembly, leak testing, building, overclocking and finally stress-testing before it could be declared ready to go. And by ready to go, we mean installing Windows and all the correct drivers. To say that this process isn't as easy as setting up the iMac could be the understatement of our journalistic careers, but this isn't to say that there isn't fun to be had from building your own PC. Despite the fact that we thoroughly enjoyed the process, the iMac is the clear winner in the setup process for its sheer ease.

LOOKS

WINNER iMac

There's no doubt that the iMac – especially the imperious 24in model – is a desirable piece of kit. Some people might find it too plain (especially when seen in photos), but in the flesh, the simplicity of its design is attractive, thanks to the self-evident quality of its casing. The iMac is a lustworthy object of hardware desirability and one of the finest looking computers ever conceived. It's also very trim, thanks to being a true all-in-one unit.

The SilverStone LC13 chassis we chose is a relatively minimalist and stylish piece of engineering, but it can't hope to match the simplicity achieved by the strong lines that form the iMac. However, we felt the biggest drawback of our system was that there's no way, without weeks, if not months, of modding, to build an all-in-one PC, and while there are many beautiful PC cases on the market, the same can't be said for good-quality 24in displays. There are some curvier models, such as the Samsung SM2433BW, but as you can see from our Labs review, the panel quality is below par. The one-piece solid aluminium stand and simple bezel design of the iMac decimates the comparatively boxy vibe of the HP LP2475. The iMac's peripherals may lack the functions and features compared with the models we've chosen for the PC, but they clearly hold the upper hand from a visual perspective.

CORE SPEC

WINNER MacKiller

Now we get into an area in which our PC can start to throw its weight around. The iMac's all-in-one casing limits it to laptop silicon (it has a 3.5in hard disk), thanks to space and heat dissipation issues. When it comes to graphics, the Mac's GeForce GT 120 is no match for our Mac Killer. The 1GB HD 4870 is a superior product in every way, as it's massively more powerful for games. While the iMac supports a second screen via D-SUB or DVI (via an adaptor), unlike our graphics card, it isn't HDCP-compliant. When it comes to CPUs, the two machines are more closely matched. Both have 45nm dual-core Intel CPUs, although our Mac Killer's chip is clocked at 3GHz, compared to 2.93GHz for the Mac. This is at stock speed, though, and we've used a full ATX motherboard and water-cooling, so we've clocked the Core 2 Duo E8400 in our Mac Killer to 4GHz. The iMac has a slight advantage when it comes to memory, with 1,066MHz DDR3, whereas with our overclock, we used a divider and dropped the speed of our memory to 888MHz. That said, the winner in this area is as clear as the winner in the looks department: our machine's CPU and graphics card are much quicker.

DISPLAY

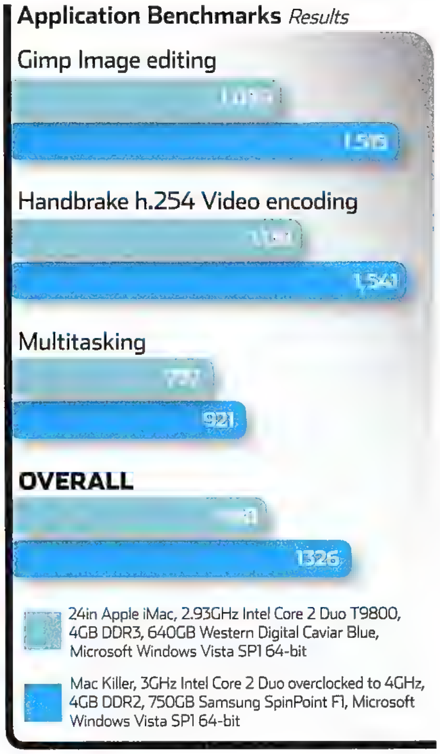
WINNER MacKiller

Both the iMac and the Mac Killer have 24in screens with 16:10 aspect ratio panels and a native resolution of 1,920 x 1,200. Having just completed our Labs test on 24in TFT displays (see p50), it was a no-brainer to select the winner, HP's LP2475w, for our build, and also to use similar testing methods for both screens. You can read about the tests in full on p52, but in brief, it comprises synthetic technical tests from Lagom (www.lagom.nl/lcd-test), in addition to real-world app, movie and games tests.

We began with HD video – the 1080p QuickTime trailer for the movie 'Serenity'. The blacks produced by the iMac's screen were respectable and much better than many of the budget displays we saw in the Labs. The shadowy areas of the trailer weren't as greyed out as some of the cheaper displays, but they weren't as rich or varied as those seen on the HP. There was also some minor colour banding on the iMac display, and it struggled to produce even blends of colour in some areas.

Another problem we had with the iMac display was its reflectivity. The iMac has a sheet of glass over the panel, which adds to the premium feel of the package, and intensifies colours and black. However, if it's placed in direct light, it turns into a mirror, and you end up looking at your own haggard features rather than what's on the screen.

With bright colours, the backlight of the iMac's display appears even, but switching to a white background (such as that of a word processing document) shows some uneven areas. The document we used to test whites also showed inconsistency in the way that iMac display displayed



Application Benchmarks *Results*

text. Some characters were slightly fainter than others, while others were fuzzy at the edges. In contrast, the HP display produced brighter, clearer whites and more consistent rows of identical digits, making it easier on the eye when running word processing apps.

When we tested Crysis on the HP for the Labs test, we were awed by the lush variety of colours produced in the exotic jungle landscapes of the game. It was a pleasure to play games on the HP – no surprise, as it won top honours the Labs test. With that visual feast of a gaming experience fresh in our minds, firing up Crysis on the iMac was disappointing. Compared with the HP, the foliage was washed-out and monotone, which was made worse by clearly seeing your reflection in the jet black of the assault rifle. From a practicality standpoint, the HP also benefits from useful extras such as an adjustable height stand, and an on-screen display that allows control over the image settings.

2D PERFORMANCE

WINNER MacKiller

With our PC's CPU clocked at 4GHz, outpacing the iMac's by more than 1GHz, we were confident about the capabilities of our iMac killer. In order to benchmark the Mac head to head against the Mac Killer, we had to install Windows Vista and different benchmarks. In the image editing test, the iMac produced a respectable score of 1,059, whereas our Mac Killer was just shy of being 50 per cent faster, hitting 1,515. The situation was similar in the Handbrake H.264 video encoding test, with our PC achieving a score of 1,541 compared to the iMac's 1,138. Multitasking was a more closely matched race, but the Mac Killer still had the edge over its more attractive adversary, with 921 points compared to the iMac's 797. There's a considerable difference in computing power between the two machines, and for a $3,000 computer, an overall score of below 800 isn't quick at all.

GAMING

WINNER MacKiller

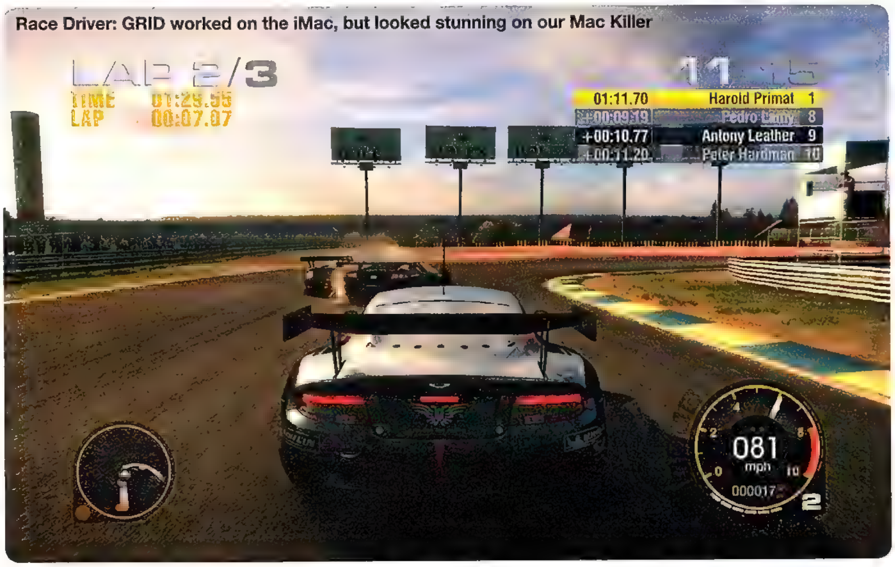
It doesn't require the intellect of a Nobel prize-winning author or a professor of quantum mechanics to figure out which computer will be the best at gaming. In comparative terms, the GPU inside the Mac is only slightly more powerful than an elderly pug, and nowhere near as cute when it looks up at you from the lounge. At the 1,920 x 1,200 native resolution of its screen, the iMac's GeForce GT 120 isn't capable of lifting any of our test games beyond a speed setting that's more appropriate for play-by-mail gaming than modern computer gaming. Gaming is now a part of Apple's pitch for the iMac, and at the time of writing, 'stunning graphics' was one of the four main sells on the main iMac page, including the claim that "High-performance Nvidia graphics bring all the speed you need to the latest 3D games and graphics-intensive applications". To give the machine a fighting chance, we opted to test it at 1,200 x 800 (our regular test resolution of 1,280 x 1,024 looked silly with the 4:3 aspect ratio stretched over a 16:10 aspect ratio).

The iMac could play Race Driver: GRID smoothly at 1,200 x 800 with 2x AA, managing an unusually consistent frame rate of 29fps for both the minimum and average. This was still sedate compared with the Mac Killer; at the same settings, it ran the game at a minimum 59fps. When we increased the resolution to 1,920 x 1,200 and cranked up the AA to 4x, the PC's minimum was a frame rate faster than the rate that we consider playable at a smooth 29fps.

Fallout 3 might be a more modern game, but it was developed with the Xbox 360 in mind and isn't very demanding for most PC graphics cards. The iMac could run the game smoothly at 1,200 x 800 when we turned off the AA and AF, and dropped the main graphics preset and texture settings to medium. While Fallout 3 was playable at these settings, its looks took a bashing and wasn't a patch on the experience our self-built Mac Killer offered. This compact wonder smoothly powered the game along at 1,920 x 1,200 with 8x AA and 16x AF, posting a minimum frame rate of 26fps and an average of 55fps.

The same pattern was repeated in Far Cry 2. The iMac managed the game at 1,200 x 800 with medium detail settings, but it looked much better on our PC at 1,920 x 1,200. Then, of course, there's Crysis, one of the most demanding games ever made. It's also one of the most incredible-looking games, in which great graphics, realising the destruction that's at the heart of the experience, are the point. Playing it at 1,200 x 800 was enough to make the iMac break out in a cold sweat; it managed a minimum frame rate of just 1fps and an average of 3fps. Only by dropping the resolution to 800 x 600 with all the sauce off and no AA could we achieve a minimum frame rate even close to playable. This fact is almost academic, though, as the game was merely a shadow of its former glory at these settings. You'd have more fun playing the original Wolfenstein on your iPhone. While Crysis massacred the Mac, it was also tough on the PC. Our Mac Killer managed a smooth frame rate at 1,650 x 1,080, although we had to turn the detail settings to medium and turn off the AA to push the minimum above 25fps.

The iMac performed better than we expected in game testing – it could actually play some games – but only at a very low resolution of 1,280 x 800, which is 56 per cent less detailed than the 1,920 x 1,200 resolution of its display. In comparison, the PC was able to power most games at 1,920 x 1,200 and they looked fantastic on the HP screen.



Race Driver: GRID worked on the iMac, but looked stunning on our Mac Killer

WARRANTY & SUPPORT

WINNER
iMac

The iMac includes 90 days of telephone technical support should you encounter any issues with your new machine and a further one year limited repair warranty. Apple provides an option of extending this to up to three years but it will cost extra. In addition to phone and online support, Apple also runs a network of retailer stores, and the Apple Store itself with technical support staff (irritatingly referred to as 'geniuses' who work at a 'genius bar.') You can make appointments over the Web for the following few days and bring your Apple product in to the store.

Macs have a good reputation for longevity. Revisions of OS X generally run faster (or as fast) as previous versions – something conspicuously untrue of Windows Vista – but Apple's attitude to obsolescence is more aggressive than that of Microsoft. This was particularly the case when it transitioned from IBM PowerPC CPUs to Intel models.

As our PC is a custom build, the warranty is only as good as that supplied by the manufacturer. However you can make matters easier by buying your hardware from reputable retailers such as PC Case Gear or MWave. Many hardware retailers don't hold stock of items, or even have proper warehouses or stores, meaning that their RMA process when an item breaks is poor at best. Buying from established companies ensures that your hardware is replaced in a timely fashion should something go wrong.

Building your own PC will help you to learn more about your hardware but the fact that you're sourcing products from many manufacturers can lead to problems. The convenience of the iMac's warranty makes this a clear win for Apple.

NOISE AND POWER CONSUMPTION

WINNER
iMac

Apple's design for the iMac leaves a very small space for squeezing in all the hardware, so we were expecting (and yes, perhaps hoping too) that it wasn't going to be the quietest machine to grace the labs. Unfortunately, Apple has really done a number on the noise reduction that borders on being a miracle. It's almost as if the core hardware of the iMac is kept in a separate dimension altogether – even with both CPU cores under load with Prime95 and 3DMark06 taxing the GPU, the all-in-one iMac emitted little more than the scarcely audible hum.

For this reason, we pulled out all the stops to reduce the noise level of our PC. We used a water-cooling system with a radiator that uses a wide fin pitch so as to be better suited to low CFM fans, super-quiet Noctua models throughout and a very quiet low-flow pump. As a result, our Mac Killer is a very quiet machine, and the difference in noise levels between idle and load was practically non-existent.

The PC has the upper hand in one aspect of noise levels though in the shape of the optical drive. The suitably slick slot-loading model used in the iMac is very noisy when it spins up. That said, while the Sony Optiarc model we chose for the job was quieter than the iMac's drive, it was too little too late for the PC. This is a competition and in each round, someone has to win. It's very quiet for a PC, but the iMac is in a league of its own in the noise department.

One of the reasons that the iMac is so quiet is the low-power mobile hardware it uses: it generates less heat and requires less cooling, which results in lower noise levels. The power consumption figures confirmed this, with the iMac drawing just 164W from the wall under full load with Prime95 and 3DMark 06 running at the same time. Our PC drew 296W from the wall under the same conditions – a massive 132W difference.

AUDIO

WINNER
MacKiller

The iMac has built-in speakers and, according to Apple's rather grand information, an "internal 24-watt digital amplifier". However, the speakers are just about tolerable for a Skype call, but when it comes to music, video and games, you'd be better off just humming to yourself. For a fair comparison between the iMac and our Mac Killer, we used a single set of Creative 2.1 speakers. For music testing, we played a range of tracks. The X-Fi and its MP3-enhancement abilities in the Mac Killer meant that baselines were noticeably deeper and crisper than they were on the iMac. The Apple machine also struggled with producing high-pitched sounds that were as clean and sharp as those from our build.

Next up was a DVD, and we chose the opening battle of 'The Lord of the Rings: The Fellowship of The Ring'. Again, it was a much more enjoyable experience on our PC. The shockwave cause by Sauron losing the One Ring belted out a satisfyingly deep boom in comparison to the iMac, and the calamitous noises of battle sounded richer and more varied. Again, the larger internal cavity of the PC allowed it to win another performance category and the small form factor of the iMac loses it another gold star. Given that the iMac uses cheap on-board audio, it isn't surprising that the sound card in our Mac Killer hands us a victory in this round.

SOFTWARE

WINNER
TIE

While there's a difference in terms of exterior appearance, underneath Macs are now PCs. They now contain much the same hardware – x86 CPUs, Nvidia GPUs, DDR3 SODIMM memory and Western Digital hard disks – as any other PC. This means that software is the biggest area of difference between PCs and Macs. A great deal of big-name software is commonly available for both OS X and Windows, including Photoshop, and FireFox. Apple also makes some of its applications available for Windows, including iTunes and the Safari browser; likewise, Microsoft makes Office for the Mac as well as for Windows.

The iMac is pre-loaded not only with OS X, but also with the 2009 version of 'iLife', a range of multimedia editing and playback software. It comprises Garageband for audio recording and editing, iMovie for movie editing, iPhoto for organising and light editing of pictures, and iWeb for creating websites. Also included is iDVD for disc burning.

Vista improved on the fact that Windows XP included very little software, adding DVD playback software, massively improving Windows Movie Maker and including Windows Photo Gallery for displaying images. In general, though, the bundled software isn't as good as iLife. Windows Photo Gallery is fine for displaying images, but it lacks the cataloguing and organisation features you find in iPhoto, and its ability to edit images feels flimsy. It isn't hard to find a free PC rival for iPhoto, however – simply look no further than Google's Picasa software, which is easily a match for the Apple app. Windows Movie Maker, by contrast, is an excellent piece of software, and while you can argue the toss as to whether iMovie is flashier or more feature-packed, it does what it sets out to do inasmuch as it enables you to quickly import clips and edit them into nifty little videos. There's no audio editing software included with

What's new in iPhoto '09

Faces
Organize photos by who's in them

Places
Organize and explore photos by location

Themed Slideshows
Show off your photos onscreen

Online Sharing
Publish directly to Facebook and Flickr

Enhanced Editing
Use new and improved tools

Travel Maps
Illustrate your journey

Vista that can match Garageband, but Audacity is a free open-source audio editor that's powerful enough for podcasts and recording music.

One piece of software you don't need on a Mac is anti-virus: OS X's Unix underpinnings, and the fact that there are so many more PCs than Macs mean that virus writers don't bother targeting Apple's machines (much).

OS X is a popular platform with developers – Apple's most recent developer conference, WWDC, sold out twice as quickly this year as last year, and there are some excellent apps for the system available from small developers. Windows is far stronger than OS X in games. Some games are released for OS X (both EA and Activision dabble in it, as well as Blizzard), but they tend to run via a Windows compatibility layer, so it isn't native OS X code. For gaming on a computer, Windows and DirectX are the dominant forces.

As Macs use standard Intel CPUs, they're capable of running Windows, both inside a virtual machine running in OS X, and natively, meaning that you can access all of the software you get on a PC, plus OS X software. This isn't a particularly valid argument for games, however; as we've seen, the vast majority of Macs have relatively poor graphics chips (only the Mac Pro towers, which start at $4,499, can house PCI-E graphics cards). While you can run games on a Mac, it's a distinctly sub-standard experience. If you enjoy PC gaming, then you'll get a better experience, and better-value hardware, with a PC. The fact that Macs are standard PCs inside means that you can hack OS X to run on a PC (turning it into a 'Hackintosh') – a process that's legally dubious (according to Apple, anyway), but relatively easy to perform if you're a competent PC user.

OS X vs Windows is a neverending debate (although it's often more of a slanging match and mud-wrestling bout than a debate), and OS X has some quantifiable advantages over Vista. We've already mentioned security, and in our experience, it suffers less from the gradual slowdown and accretion of crap that still blights Windows installs. It's less noisy than Windows – Vista's UAC and fondness for pop-up notifications and bubbles make it severely irritating. Pop in a USB flash drive and in OS X, it simply appears on the desktop. Vista interrupts you with a massive autoplay menu. Expose, OS X's method of switching between multiple Windows, is also much better than Vista's useless Flip3D. However, to some extent, it comes down to personal preference. OS X isn't without its annoyances, one of which is that Apple tends to be less generous than Microsoft with its free updates. Free patches for OS X are almost entirely limited to security and stability issues, whereas Microsoft has a long and admirable record of using free Service Pack releases to add new features to Windows.

OS X is more secure, and on balance, is a better OS than Vista, but with so much software available for both systems, and gaming being far better on Windows, there's a lot in favour of the PC too. This round is a tie.

DESIRABILITY, SATISFACTION AND VALUE FOR MONEY

WINNER
MacKiller

When we first unboxed the iMac, it seemed a very desirable machine: gorgeous to look at, improbably slender and very shiny. Several weeks later, we're less convinced. It's quiet and good-looking, and of course, 'it just works' and did so straight out of the box. There's considerable satisfaction to be had from the closeness of the design of the hardware and software, and small conveniences such as being able to trim volume and screen brightness directly from the keyboard.

However, $3,000 is a lot of money to spend and in a direct comparison with a PC, you can see where corners have been cut: the display and audio are average, performance is mediocre, and the peripherals leave much to be desired during use. The bundled software is fine but it seems more relevant to newbies: for more experienced users such as ourselves, it was less relevant, and we were soon eschewing iPhoto for Photoshop for instance. While we accept that the iMac isn't intended to be a gaming powerhouse, for a 24in, three-grand machine, the GeForce GT 120 is far too stingily specified and will age very quickly.

One argument many Mac users make is that they're satisfying machines to own: they exude a sense of quality, good design, and someone having put thought into form and function. That is undoubtedly true, and were we comparing the iMac to a box from Dell or smaller PC builder, this feeling would definitely count in the iMac's favour. We're not comparing it to a beige box, however; we're comparing it to a PC we designed, built and modded, and while that process takes time, when the end result works, looks good and performs well, it's a tremendously rewarding process. Add in the fact that the Mac Killer is good value for money in terms of performance, and the quality of its display, and we feel it's fair to give the Mac Killer the victory in this round.

Results

When we first had the idea for this feature we figured beating the iMac would be easier than drinking beer by the pool on a sunny day. However, as the results show, it was a much closer fight than we expected. The iMac is a terrific computer in terms of looks, noise and feel. However, the feel of quality is let down by the performance of the core hardware and display. OS X might be superior to Windows Vista (we're undecided as to how Windows 7 compares), but when it comes down to it, the iMac is easy on the eye, but you just don't get as much machine for your money as you do with our iMac killer.

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Resumes and demos

Chris Taylor offers essential advice for jobseekers creating a resume for the first time.

Resumes

Penning your first real curriculum vitae – a resume, if you will – is challenging. If you worked through the latter years of secondary school at a fast food establishment or supermarket, you probably would have just filled out an application form. Sure, you had a resume, but at fifteen years of age it's not a meaningful thing. It was unlikely you had or needed any qualifications or experience. If you're looking for a job after, though, or something that'll pay the bills while you study but is also a step towards your future objective of becoming an information technology professional, you need to learn how to write a respectable curriculum vitae.

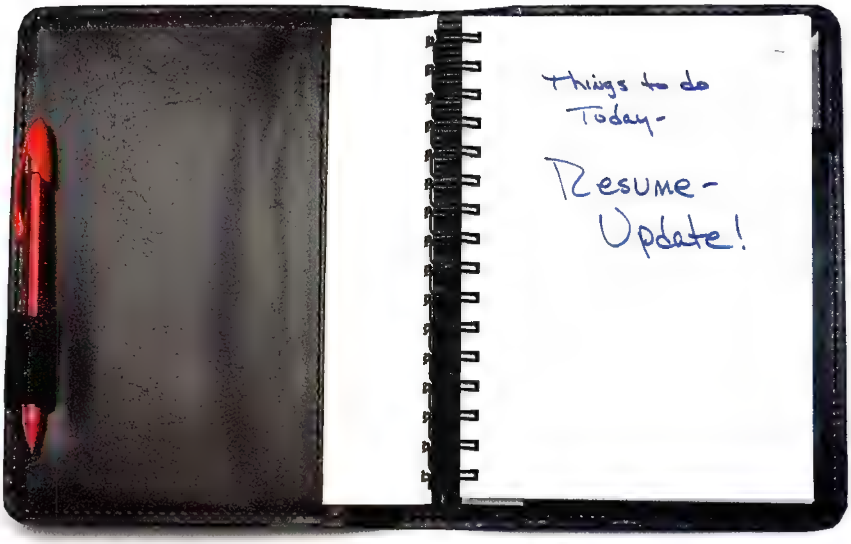
A curriculum vitae should be concise and to the point. It's not a forum to be airy-fairy about your qualifications, knowledge or experience. Consider the lessons of Strunk and White: include all relevant information, but discard everything that's irrelevant. Never use two words when one will do. Ensure you use words correctly. Our language is as precise a tool as mathematics. Your employer should be able to read your resume and immediately understand what you can bring to the position. Use your resume to demonstrate that you can communicate clearly.

Length is an important point. Even if you have a lot of relevant experience or qualifications, your curriculum vitae should not exceed three pages in length. A lot of people have applied for that job. The person who is charged with reading through all the resumes may not have the time or inclination to read through your five-page epic. Again we come back to the point of being concise. If a detail isn't relevant, par it down or cut it out altogether.

It is important that your resume is tailored to the job you're applying for. Don't create a resume and send it to every company that happens to have an ad on seek.com.au. It is better to apply for fewer positions, using a specially crafted resume in each application. Write a basic resume and then, when you apply for a position, carefully consider the selection criteria and adjust your resume accordingly. If the employer is looking for someone who knows Java, ensure points related to Java move to glaringly obvious positions in the 'experience' and 'qualifications' sections of your resume.

Depending on the nature of the position, it

Don't create a resume and send it to every company that happens to have an ad on seek.com.au

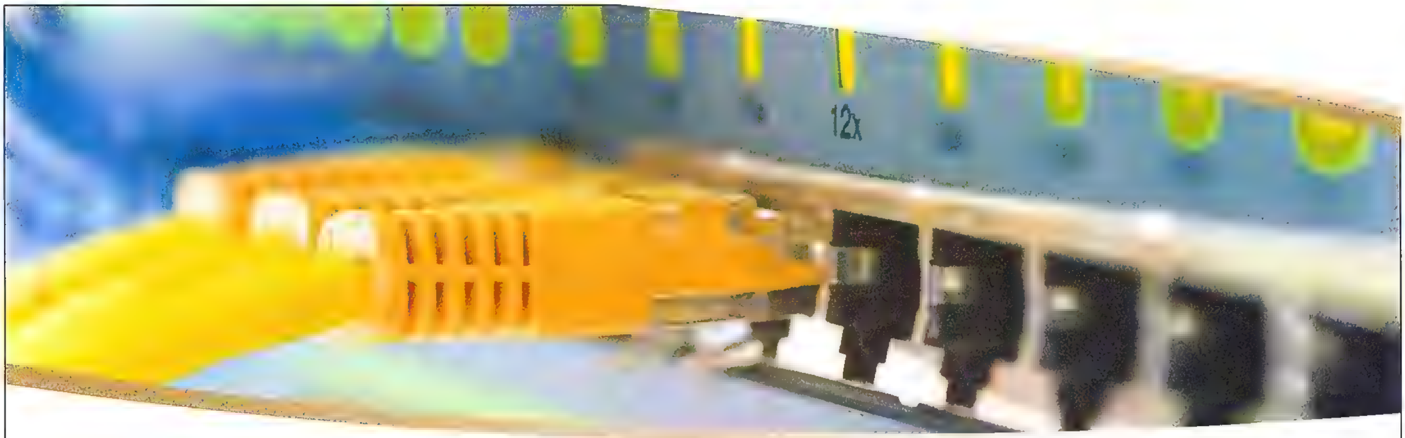


may be worth spending time researching the company. The more knowledge you are armed with the better: not only can you produce a cover letter and resume you know will appeal to them, but if you get to the interview stage you can walk in with much more confidence.

Formatting can't redeem a resume, but it can destroy an otherwise good one. You've probably heard this advice a thousand times before, but it is worth repeating: keep it simple, stupid. Use plain white A4 paper. Use black text. Use 12 point Times New Roman. Use clear headings for your sections. Break information up logically. You will hear some employers argue in favour of a table-based format for resumes, but you will hear just as many employers speak ill of the same. Either is fine so long as you organise the information logically!

The type of information you include can vary considerably from application to application. You always need to include personal details, a list of skills and attributes, contact details for a couple of people who can vouch for your employability and information on your education and experience, but you also have the option of adding extra details such as a summary of your career objectives or a list of your interests. The former is excessive if you are seeking an entry-level inbound call centre position, but would not be out of place if you are seeking with greater opportunity for advancement. When an organisation takes on a new employee, the organisation will likely spend a lot of time and money training that person. Organisations want to know that that employee will remain an employee for a long time. In that vein, mentioning qualifications you intend to acquire in the near future is worthwhile, so long as they're qualifications that would be valuable to that company.

When listing your skills and attributes – that is, to say, your strengths – do not be airy-fairy. Be specific about what you are going to bring to the position and to the workplace as a whole. At the same time, keep in mind the basic rule of written communication we outlined in the second paragraph: be concise, be concise, be concise. Ditch the wank in favour of including selling points that are meaningful. In the 'experience' section, you should describe what you achieved in each job and provide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specific examples of how, in those jobs, you exceeded the employer's expectations. Perhaps at your age you only have one or two entry-level jobs to include on your curriculum vitae, but it is quality that counts. Simply saying you worked at a company from August 2003 to November 2004 doesn't mean much in itself. When you are more experienced you will doubtlessly have to pick and choose which positions you elaborate on, but if you're reading this guide that is a long way off.

Finally, never send out a resume that you have not proofread. If you're unsure if you've used a word correctly, refer to the Macquarie Dictionary. Read the resume in its entirety aloud to yourself: if there is a section that is awkward and makes you, the reader, pause and stumble, it would be worthwhile revisiting it with a red pen.

Demos

When seeking employment in creative industries such as games development, it is not unusual for prospective employers to want to see a tangible demonstration of your knowledge and experience. Most institutes offering diplomas and degrees in games development are aware of this and include some sort of group or whole class project in their program, providing a demo game that those students can show off when they graduate. Such projects are more accurate simulations of professional games development than isolated programming or animation exercises, but the notion that a school project alone can get you a job is wishful thinking. Sure, graduates have done just that, but employers know the applicant had to work on the demo game. It was a requirement of the course. The applicant's efforts may be of a high standard, but he didn't choose to develop this game on his own volition.

It is the goal of many a mod or garage game developer to move into professional development. An institute such as the Academy of Interactive Entertainment is the perfect place to meet people who can help you turn out the next Counter-Strike, but before spending weeks drafting an ambitious concept that would realistically require six or eight of your classmates to make it a reality, consider the future implications. When you take that mod or game into an interview, the employer may well be impressed in the sense she thinks it's a fun game, but they will wonder exactly what role you played in the development team and whether your contributions had any significant role in making the game entertaining. Team efforts show that you can work in a team, but they don't necessarily show what you can do. There are scenarios in which this isn't an issue, of course. If you were the one audio guy on an independently developed racing sim developed by a dozen geeks in your parent's garage, you're in a different position to one of six coders.

> Your game need not be complex, but it must be of a very high standard. It should look good. The code should be clean.

Your best bet, if you're an artist, is to team up with a programmer and vice versa, unless you're competent at both disciplines. Rather than seeking to develop something that has as large a following as Desert Combat, refer to the brilliant adage of KISS: keep it simple, stupid. Your game need not be complex, but it must be of a very high standard. It should look good. The code should be clean. It should be as free of bugs or 'bonus features' as you can possibly make it. Test it and have your friends test it. Ultimately, it should be fun. After all, games are designed to entertain. A game need not be large in scope to entertain. Consider games like Snake and Tetris. They are very simple, yet once you start playing them it is hard to stop. It is that quality, simple amusement, that is really what employers are looking for in a demo. Good graphics and neat, error-free code facilitate entertainment, as well as tangibly demonstrating what your degree says you're competent in.

Zombie avoidance strategies

It's not as daft as it sounds, honest!

Like me, you've probably evaluated your chances of survival during the Inevitable Zombie Apocalypse (IZA). And, like me, you've probably considered your skill set for the aftermath, when society has broken down and only the ruthless, the devious and the highly-skilled survive.

If you're not already living in some sort of survivalist camp in Nevada, however, I've got some tips for you that amount to more than, "I'm useful and/or cute, so please admit me to your rugged band of individualists".

Don't forget clothes and good quality boots – this isn't Hollywood, and you're going to get grubby...

First up is your grab-bag. This is vital for the immediate 72 hours of the apocalypse, whether by fire, flood, quake, aliens or undead infestation.

My tips come by way of my good friend Zac in San Francisco, who is used to the idea that his habitation may become ocean or rubble at any moment, and has prepared accordingly.

He keeps grab bags for his parent's house and his flat, as well as survival supplies in his office. They're based on the San Francisco 72 hour self-sufficiency kit go-bag (**http://72hours.org/go_bag.html**)

His basic strategy is to have enough supplies at the office to make his way home on foot, if necessary, and enough supplies at home to shelter for a week.

Consider the kind of threat you'll be facing. Zac's prepared for fire, riots and earthquakes, particularly. His suggestion is to subscribe to bushfire tracking services for fire threats, to follow local and global politics for potential riots, and to bookmark earthquake.usgs.gov for earthquakes.

In San Francisco, of course, Earthquakes are a big concern, but Zac's not too worried.

"I figure my existing cupboard of resources (food, camping stove & gas, lights, candles, matches, etc.) are perfectly fine for anything under 6.0. My primary planning has gone to these shelter-in-place strategies, and my 'go bag' reflects this philosophy. I have large stores of water (two litres per person per day with negligible sanitation), a water boiler (which can provide more potable water), and a backyard (for emergency out-housing). This year, I'll get my rain barrel set up to collect rainwater for my garden, which can double as another water source in extremis. I also have caving helmet and lighting equipment, which gives me a few slight advantages."

He notes wryly that an earthquake of 8.5 or higher is likely to make the go-bag more of a burden than an asset, as it weighs you down when you need to be fast and on foot. He's planning to buy a bag with wheels or a bike trailer so that he's prepared for this eventuality. Adding spikes or other sharp objects to your bike trailer's wheels also helps against zombies.

Zac keeps a bundle of critical documents in a safe location where they can be easily grabbed and added to the go-bag. We'd recommend The Zombie Survival Guide be kept close.

Zac suggest keeping bottled water throughout your house to increase the chances of finding water immediately in an emergency. It's worth considering whether you can gather seven day's supply of food and water, rather than three – three will last until the emergency services have tackled fires and immediate threats and can begin rescue efforts in earnest, but seven means you can feed neighbours, too.

Another tip is to plan out a number of routes to exit your city that avoid bridges and potential rubble that would prevent your escape. Plot two or three, and you should be well-prepared.

For your go-bag, remember to include canned foods and dry food packs (like muesli bars) that are long-lasting and don't require frequent replenishing when your grab-bag is not in use. You'll also want a can opener. Chemical glow sticks provide light, without the risk of fire. You might want a dust-mask, but a wet tee-shirt works just as well if you have enough water handy. For communication purposes, an emergency radio (whether wind up, photovoltaic, or battery) comes in handy. Spare batteries are always handy, too.

Don't forget cash in a range of denominations, for vending machines, bribes, buying things from fellow survivors and the like.

Your last essential items should be a first aid kit (and the certificate to use it!) and a good quality multi-tool, such as a leatherman.

Don't forget clothes and good quality boots – this isn't Hollywood, and you're going to get grubby and smelly pretty quick come the apocalypse. Plenty of socks & undies reduce the need for quite so many changes of clothes, too. While you're considering cleanliness, factor in a spare toothbrush, toothpaste and cloth-wipes.

Powertraveler has now released a number of inexpensive photovoltaic chargers in Australia, and one could prove invaluable for your mobile. Even when the power is down, there's usually plenty of sunshine and you only need a couple of hour's worth to charge a phone.

For tackling Zombies, remember to invest in a quality shovel with a long handle.

Good luck, survivor.

Should the apocalypse come, Zara Baxter has skills in brewing, fermenting, wound treatment, growing vegetables, minor surgery and archery. .

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GAMEPLAY

GAMES, GAMING AND FILM COVERED... ATOMIC-STYLE

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Starcraft II. We've played it, and we're in a sharing mood. Justin Robinson's got a special report straight from the mean streets of Irvine California on the multiplayer game of the most awaited RTS of all time.

And that's just for starters, this month!

We've also got a report straight from the show floor of E3. Our intrepid reporter slogged through booth babes, launch parties and endless Los Angeles sleaze to bring you a very special report on the biggest gaming show of the calendar.

And then there's our reviews; we've spent time blowing up Mars in Red Faction: Guerrilla, cracking wise with Bill Murray in Ghostbusters: The Video Game and mutating for justice in Prototype. Plus, we've had time with pre-release code for the new Bloodbowl video game. It's based on the old Games Workshop miniatures game, and it's the most fun you'll have with a spiked football this year.

And then there's our Transformers movie review... let's just say it's very Michael Bay.

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STARCRAFT II

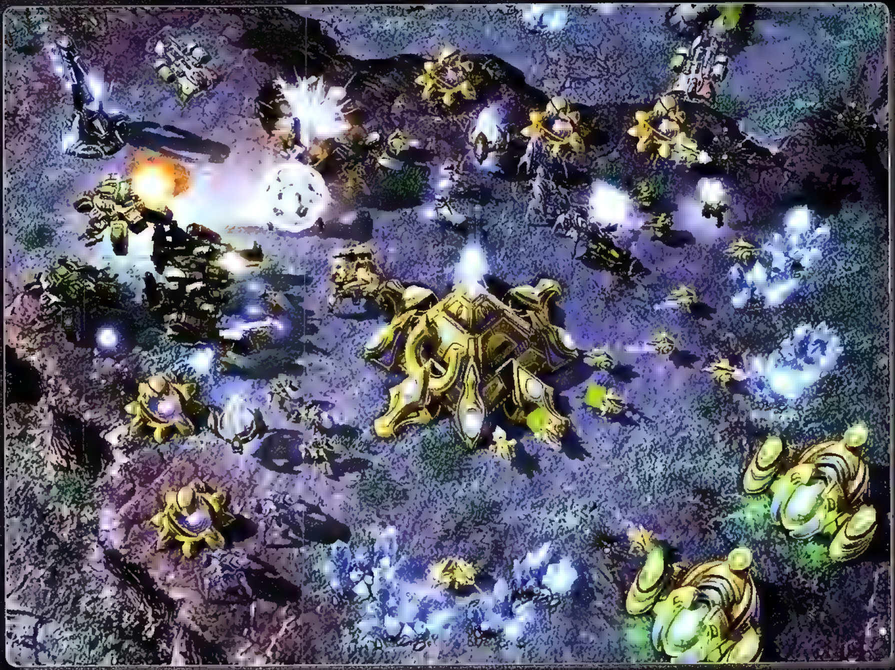
Justin Robinson dives into the biggest RTS of the 21st century!

The original Starcraft game was a phenomenal success for developer Blizzard, one that today is still at the top of most serious gamers' RTS pile, mostly thanks to the incredibly tweaked balance and great dynamics. So huge is its influence that it's regarded as a truly competitive sport in Korea; with expert players receiving sponsorship deals and intense training just the same as athletes. With millions of copies sold, hundreds of thousands of hours racked up and more than a few addicts well versed in units and lore, Starcraft has been one of the most successful games ever. Its reign has lasted for almost a decade, but finally the sequel is truly coming out – Starcraft II. Being made by the developer that Atomicans voted worldwide best, this has an added expectation of quality added to it that other titles just don't. Blizzard is aiming for a late 2009 release, but when it's done is when we'll get it. The real question is... should you care?

Inception and planning

Kicking off in mid 2003, the game was really taken into serious coding during 2005 where most of the Blizzard team could hop off working on Warcraft 3: The Frozen Throne and finally get working in earnest. The concept of a sequel had been kicking around for quite some time by then, but the full green light had been lit and Starcraft II was born. They knew they wanted to do something a little different with it but also manage to keep the same feel, so first set out to define exactly what they needed to change. We spoke briefly to Chris Sigaty, the Production Manager for the game, and his goals were to "Harken to the legacy (of Starcraft)... updating the game for a new generation and keep the nostalgic feel".

Weaknesses in the first game were identified and systematically worked on according to their importance; the first being a whole slew of new units that we'll mention in a minute, accessibility with information reporting and introducing new dynamics into the game that will mix things up from the norm. Running the danger of ruining the almost fanatical following they've got, there's a huge amount of changes



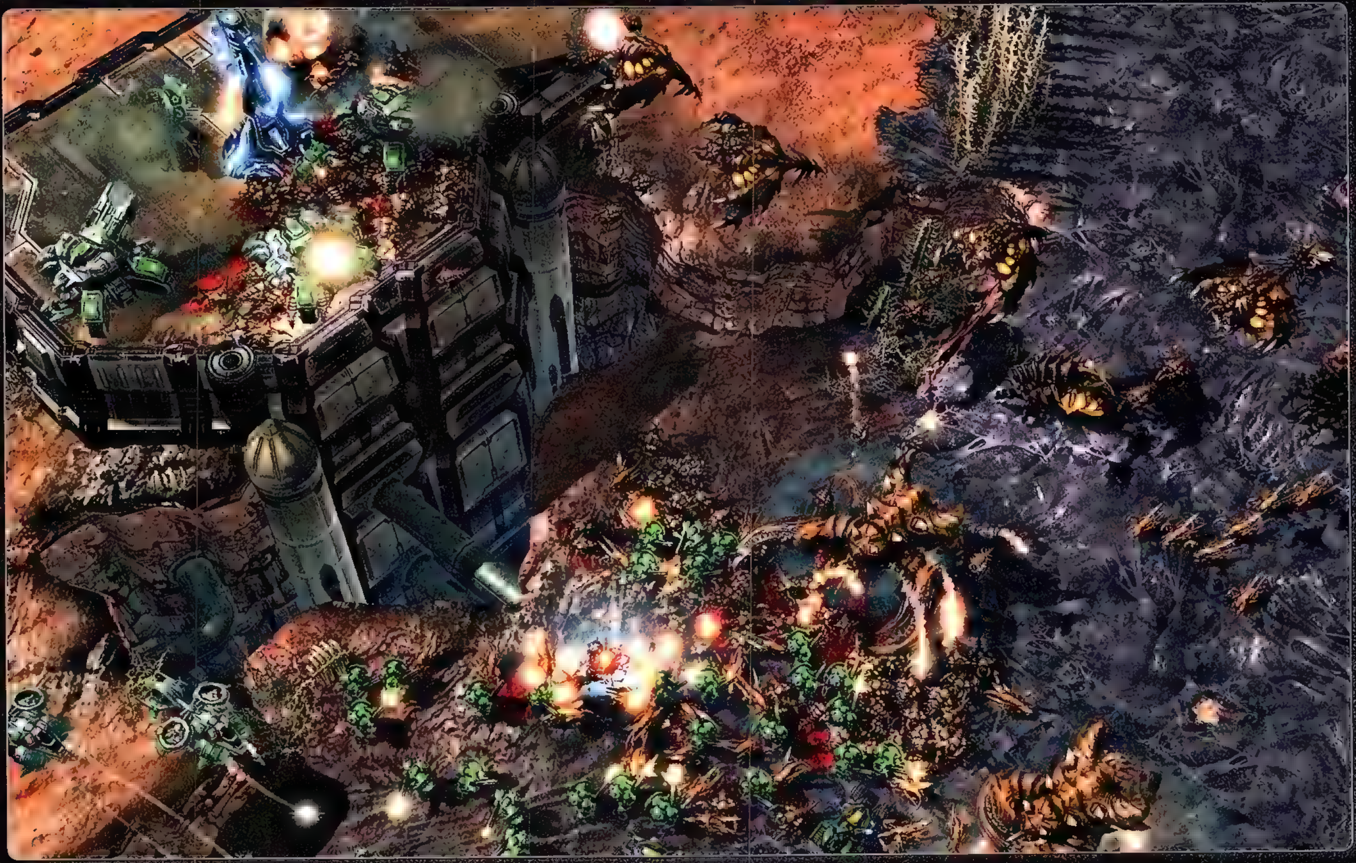
Expansion bases are the only way to survive long-term.

– which all started with some tuning under the hood.

Before any new game can be released for this generation of gamers, it had to be updated to a custom-made 3D engine first. Two dimensions might be enough for the original but an incredibly limiting 640 x 480 resolution just isn't enough to get detail going, so they assembled their own engine fully capable of pumping out eye-candying graphics. We asked about the engine's requirements and while they're not set in stone we can definitely confirm that it's Shader Model 2.0 minimum, will take advantage of multicore CPUs to increase performance (though the amount of threads used was not mentioned) and will require a beefy system to run the game with all the bells and whistles turned on. For those out there without the bleeding edge of tech (shock-horror!), the game will still run very smoothly on lower settings and is designed to be very scalable. While it is still perspective-locked most of the time, you can now zoom in and temporarily rotate around objects to get a better view. With a shiny new engine in place, the real work could begin.

Calling all recruits

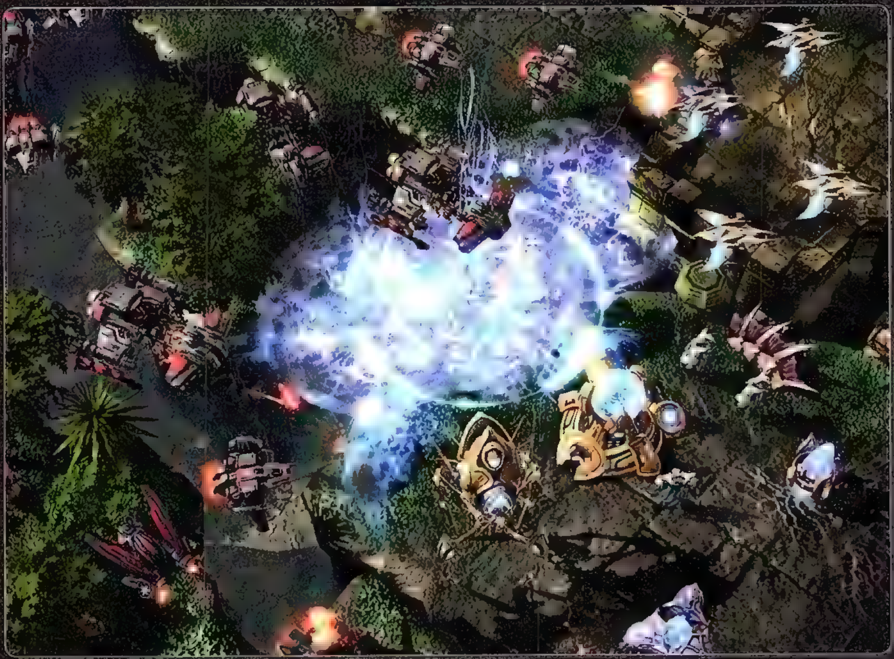
Most PC gamers have at least a basic knowledge of the three Starcraft factions: Terrans (human), Protoss (high-tech aliens) and



Three-way battle between all sides become complicated.

Zerg (aggressive primal aliens). Each side has a distinct playing style, something that Blizzard's tweaked in Starcraft 2 to become even more apparent. Terrans focus most on being good all-rounders, with slow-building units at a decent cost that deliver some nice damage in both early and late stages of a game. Added to their side are new units such as the super-massive 600mm cannon-armed Thor walker, complete with Arnold Schwarzenegger-like voice, transforming aerial/ground assault Viking crafts and perhaps most interesting of all – the Mule. Lasting only for a minute or so, the Mule is a high-capacity crystal harvester that is called in from an upgraded Command Center to increase crystal gathering significantly. This doesn't seem like much but when every bit counts this is definitely a welcome addition to the Terran side. The Terrans are the easiest side to understand when progessing through the tech tree, and each important unit requires a specific and clear structure – such as the Ghost Academy that unlocks the cloaking specialists (seen on our cover this issue).

Protoss also manage to hang on to the same feeling as in the original game, being predominantly users of high-tech units at a large cost of both time and resource, but managing to pack a powerful punch. They're most likely to have additional abilities too, with units such as the Zealot being able to



Protoss PsiStorms rage underneath an aerial battle with Terrans.

chase down fleeing enemies and zip across small distances in a flash. Fans of the popular Dragoon will find it curiously absent, though there are replacements like the Stalker, filling the same role at the same early stage of the game. Protoss aren't the fastest builders, nor upgraders, but when they get into the higher levels of the build tree their units become incredibly powerful – using a mix of abilities is the best way to take advantage of their units. Running in a group of Carriers with an Observer to scout the way and a group of Zealots underneath is still an effective strategy (and indeed the first one we tried), but with all the new units and abilities added in there's much more of a motivation to shift and adapt to an opponent to take advantage of every tool available.

The final creepy-crawly race is the Zerg, an organic aggressive race that works best if they attack early and often, moving to capture as much land and resources as possible to overpower their opponents as fast as possible. Hydralisks and other specific advanced units require their own buildings to unlock, though we found each unit has been tweaked to be less effective on its own. Powerful new units such as the constantly-healing Roach are great frontline sponges for damage, but aren't very good against many targets. This forces the player to play around with different combinations of units, something that is a welcomed change for those out there usually content to build X amount of units and send them all in at once. And yes, Zergling rushes still seem to work and sufficiently irritate your opponents!

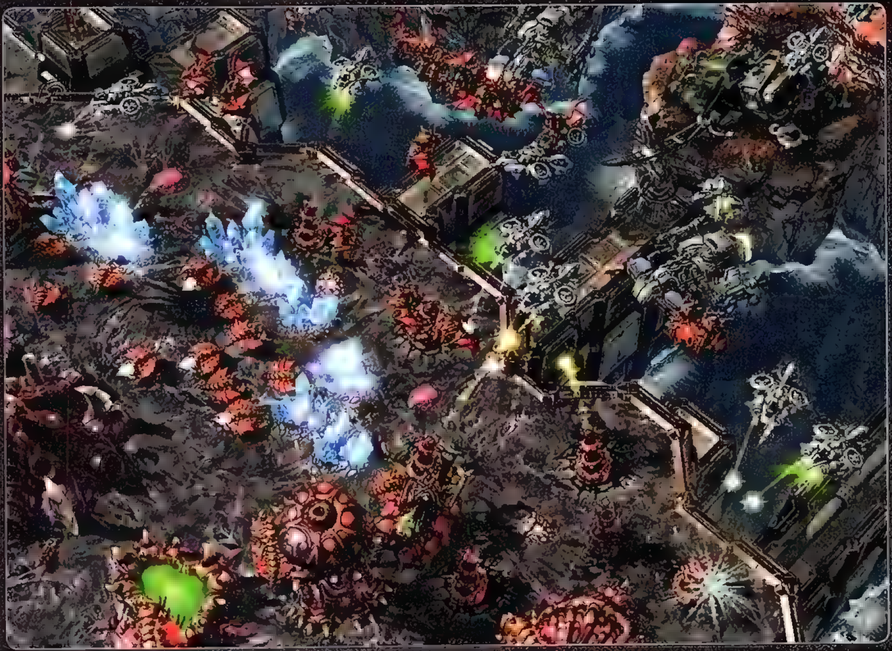
Information deficit

One of the biggest gripes with the original game was that in high speed games there could (or should) have been many things going on at once – and unless the player had an eerily powerful memory it was at times a lot to keep track of. The game has now been retooled to give a lot of extra flexibility to the player, providing a real-time list of completed buildings as small icons appearing on the left side of the screen. They're small enough to not interfere with the action, but they make sure that you can't miss when a unit is produced (and even smart enough to know when multiple units are completed at once), a building is finished or upgrade completed. Replay mode for post-game viewing has been extensively reworked to include a second-by-second list of building and unit steps (great for seeing just how your opponent managed to get in your base and kill your d00ds), as well as special information such as clicks per minute and even an average click-rate for the whole match.

Blizzard's also added the eternally useful idle worker button onscreen with a number and tied it to the tilde key, making finding lazy workers very easy. When unit groups are assigned, they are numbered along the top of the bottom info bar with small preview pictures to help remember what you've got where, and the unit selection limit has been completely removed – you can have an unlimited amount of units in a group, up to the usual 200 population cap per side. A total of eight players (with four observers) can duke it out against each other at a time.

Dynamic shift

Starcraft II has upset the usual balance and order of the first game a little through the addition of units and very easy review of



Tenacious Terrans attack Zealous Zerg.

opponents, but they've also changed the mechanics of how the sides will use their capabilities to their particular advantages. Blizzard have done a wonderful job of keeping the Terrans feeling exactly the same to play, but with a slew of new units and tactics available under their belt. The absolute best thing they've changed is that Supply Depots can now be sunken underground at will – meaning your ground units can pass easily. As competitive players send a single unit to scout out bases (and potentially harass economies), the most common Terran solution is to build a Barracks with Supply Depots either side to physically stop enemy units – and now can simply be lowered to move an assault forwards. Most Terran buildings can use either a Tech Lab add-on to unlock the higher level units such as Ghosts, or can use a Reactor to add a second build queue to the structure to double-pump the army and bolster ranks quickly. These are just a few improvements that really help the Terrans get their armies up and running, and offer a great duality of choice between large low-tech unit counts or smaller high-tech groups.

The Zerg were the final race to get tweaked, and in terms of feel they're radically different from the original Starcraft, but that's not a bad thing.

Of all the sides we found the Protoss to be the most interesting, but the almost daunting number of units and upgrades can confuse at first. They can boost their economy using a spell-casting Obelisk tower, using Proton Charge on their Probes to increase the rate of crystal collection – just one of three total spells the Obelisk can cast. The most intriguing change to the Protoss is that the unit-building Gateway can warp units to any Pylon on the map, saving a little time and helping to bring them all the way up to the frontlines in a short build-time of five seconds. Multiple Gateways with warp can be constructed, meaning that four or five units can be warped in very easily to that Pylon hidden behind the enemy lines. The addition of a Protoss Mothership is more a dynamic change than just a unit addition; apart from the beam weapons it possesses it also cloaks units and structures underneath it in a decently large radius. This means you can send a single Mothership and hide an army underneath, or simply hide bases/defences underneath it. As a side the Protoss feel a little complex right now, but they're definitely the side that make you explore around a little.

Terrans defend the Cliffside from a Protoss attack.

The Zerg are the final race to get tweaked, and in terms of feel they're radically different from the original Starcraft, but that's not necessarily a bad thing. Building a Zerg base is now much easier, with no Creep Colonies needed to get into building the rest of the base. It means that the base will be much more compact, but also that it is less important to lay it out 'correctly'. They still sacrifice a worker Drone to build their structures, and all units are created from the Hatchery-created Larvae. The biggest change is the addition of a Queen unit that can also be built; this can seed the Hatchery with spores and increase Larvae production by a huge amount for a minute at a time – meaning that the Zerg can pump out a huge number of units in a very short amount of game-time. Another ability of the Queen is production of Creep Tumours, basically nodes that increase the coverage of the Creep that aids unit movement speed. Even Overlords have a diarrhoea-esque ability to generate Creep while stationary, and while it might be gross it is a great way to keep Terran or Protoss opponents from expanding – they

can't build on the Creep at all. These different ways of using the Creep make it as much an essential tool as the Drone, and mastery of it can mean wonders for skilful players.

Even the maps themselves are now able to be changed and used differently, thanks to the placement of destructible rocks that block off a secondary entrance to bases. These prevent early rushes through there, but later units can smash through them with ease and provide two fronts to defend. There are golden crystals dotted around maps which provide six crystals per trip instead of five, making them a very enticing expansion option – and a great place to scout for an enemy. Special field-of-view blocking walls such as forests are placed strategically to prevent ground units from seeing what is behind them, and giant Xel'Naga towers allow a giant radius of sight when a unit is stationed next to them.

Power overwhelming

As with any sequel that sets out to improve on something already good, there's a large risk that there either won't be enough change to justify it or there'll be so much it will drive original fans away. It thankfully isn't the latter, with pro Starcraft players testing the game throughout development; although they have to relearn and rethink strategies, they had no reservation attaching their stamp of approval to it. Most vocal have been those who think changes such as unlimited unit selection may remove the pro-level gamers by making it too accessible – but we challenge Average Joe to keep track of everything going on at once and still win. So we can be sure that fans mostly approve of the game, but is it enough to swap to?

With a new game engine, huge shift in feel and strategies and brand new Battlenet service coming into play, we'd definitely say yes.

Starcraft II may only include Jim Raynor's Terran singleplayer campaign 'Wings of Liberty', but Chris Sigaty reckons it's part of an "Overarcing tale that [we're] telling", meaning that the other forces may indeed get their own tales to tell. For multiplayer however this is still some of the most solid gameplay that you'll find in any RTS game to date, and the sequel to Starcraft is finally at a stage where we'd call it a worthy successor. Atomic is looking forward to getting many hours clocked up in Starcraft II, and it doesn't get much better than this.

Hell, it's about time.

PC

Developer Blizzard Entertainment
Publisher Activision Blizzard
Website www.blizzard.com

✓ Great gameplay, new units and more.

✗ May not feel completely new to some.

Anticipation rating
Blizzard look to hit us with another winner when Starcraft 2 hits the shelves.

94%

E3 Diary 2009: The big show is back!

The biggest gaming event of the year – and **Seamus Byrne** was there!

E3 almost died? Walking up to the LA Convention Center this year, you'd hardly have known it. After a couple of years in the wilderness of hotel rooms and small meetings, the show floor was back. The last time E3 had a show floor Nintendo launched the Wii, Sony talked MASSIVE DAMAGE, and Microsoft promised us Live Anywhere (and this was all before Vista too). Hardly surprising then that Nintendo has dominated the sales charts ever since.

Whatever its flaws, E3 still sings a siren song to anyone who calls themselves a gamer. With the promise of a resurrected show floor it seemed the right time to head back to LA once more and see what the industry has in store for the year ahead.

I did not come home disappointed.

Day Zero

First stop Microsoft. Good games, great new features for Xbox, and Project Natal blowing minds. Peter Molyneux over-egged the Milo experience, like he does with most of his faith-based hype of games-yet-to-come. But a 3D, depth perceptive, face and voice recognising, total body motion control system can't be ignored – even if you look like dick using it. This was something special, and it's a disservice to our collective optimism for a science-fiction future to deny that.

Next EA. Two dozen Jedi (well, okay, Jedi-robed fanboys) marched out onto stage as Bioware talked up some new details on its MMO, The Old Republic. The announcement that every — yes, every — character in the game would be uniquely voiced, in the biggest ever voice acting project to date, showed they are aiming squarely at heavyweight status with their new online universe. Now, how the hell do I sign up to get my voice in that game?

Then the Beverly Hilton. NCSoft showing off their new MMO, AION. Nice features, tasty Asian flavour, fun alternative travel system (no mounts, but you get wings at level 10). Doing well in Asia already, which is a nice sign for its longevity. We point out how much Aussies hate getting ignored when it comes to local servers. They actually listen and promise to test whether an Asian server location for Australian players might be better than the US when the game releases. Kudos.

Holy crap. This was the quiet day…

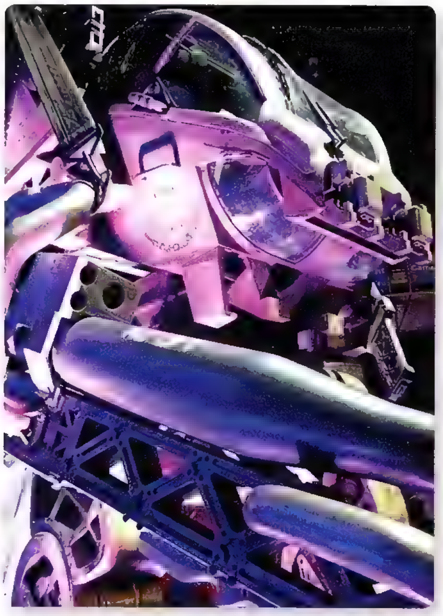
Day One

Nintendo conference. Snooze fest. But hey, they're bathing in cashola right now. That might have distracted them a little. Wii Vitality Sensor? Oh dear. A new Metroid made by Team Ninja? Hell yes!

Almost missed Sony due to a dumb LA shuttle bus driver. Yes, an official bus taking us to the venue forgot where the venue was. The punchline? I was the guy who told the driver we weren't going the right way. An Aussie telling an LA bus driver where to go? FFS!

Finally there, Sony put on a good show. It's make or break time at Playstation, and they had exactly what they needed — a great line up of games for both PS3 and PSP. It just made you happy to be a gamer. The kind of session that made you want to hurry up and get down to the show floor. Good thing that was next…

Show Floor. First stop Ubisoft to taste the delicious new cinematic style of Splinter Cell: Conviction. We talked with the developers on a walk through the demo, but something we'd missed first time slammed us right between the eyes now. In the text and video overlays used to convey story, this time we realised that just as you approach your target, the guy who killed



your daughter, there is a moment on the stairs where you see her face and then her gravestone. I've rarely felt such a direct connection with a game character's inner feelings before. Of course you're about to kill this guy! Look what he's done to you! Pure gold.

R.U.S.E. Talking about an RTS like a poker game? Damn if it isn't intriguing and this layer of subterfuge, misinformation and revelation looks like a real fresh shot in the pants for a genre held close to my own heart.

Homefront. Shows a lot of promise. Written by the guy who wrote the screenplays Apocalypse Now, Conan the Barbarian and Jaws, and the writer/director of Red Dawn. It's an American occupied by North Korea in 2027, and the resistance effort to take the country back. Killer concept: the 'drama engine', that brings all the visceral moments up close to your character to make the experience pop. So when a car crashes near you, it'll crash in such a way that makes you feel like it only just missed you for that added adrenaline rush. Nice.

Space Marine. We're talking action RPG where you can customise your Marine weapons and armour, and the gameplay looks kick ass — a nice 'up close and personal' shift from the Dawn of War series. Plus, while they would only give a wry smile and offer no comment, the closed door version of this trailer showed Tyranids in its closing scene. Bring 'em on!

Party time with Sony. In true Aussue form, we drank the 'Beauty Bar' dry of beer. Then rolled on to catch up with the Warner Bros crew...

A few drinks with Warner Bros at a bowling alley bar, then a Nintendo reception for dinner and more drinks. Still kinda lagged, so this one's an early night.

Day Two

The monster day of closed door appointments. 16 back to back slots. That's even too much to just sum up, so let's pick out a top five.

Borderlands. At first blush, you think it's a Fallout 3 wannabe. But then the devs point out their love of Fallout, of WoW, and the rest, and how they wanted to take the best features of great games and make a four player co-op post-apocalyptic open world game. Hard to argue with that. And it looks hot too.

Singularity. Think TimeShift, only done right. Smart use of time powers that become both weapons and puzzle solving tools.

Alpha Protocol. A Bioware RPG with a modern espionage setting. The demo was a bit flat, but really nice ideas in how to make the game live in the 'grey' area of morality.

Ended up failing to make about three or four appointments. Not bad given the distances I had to run between rooms. But that's the kind of day you need to wrap up with a few drinks.

Party time with Sony. In true Aussie form, we drank the 'Beauty Bar' dry of beer. Then rolled on to catch up with the Warner Bros crew again at a nearby hipster bar 'til the wee hours. After this, Day Three was going to be an uphill battle...

Day Three

Sore heads prevail, but thankfully it's an easier start today because we're meeting up with the Sony people we were out drinking with all night.

Two great surprises today. The first is Tatsunoko versus Capcom. Tatsunoko? Never heard of them. Oh, you mean the cartoon company behind Speed Racer and Battle of the Planets/G-Force? Awesome! We throw down with Ken the Eagle against Ryu for some Wii fighting fun. This one is a party play dream, with ridiculously overpowered Ultras making it truly over the top fun.

The other is Scribblenauts. Words fail to describe this game. No, wait. It is all about the words. Write a noun, any noun, and the object appears in game. If it's not a trademark, and it's not profane, they claim it's in there. And geeks just can't help but test that theory. I never saw it fail, and the coverage online seems to agree. They've even got net memes in there — if you want Keyboard Cat to play someone off, it will. This is a game worth buying a DS to play.

Dragon Age: Origins. My first serious

disappointment. I want this to be so good, but all they showed us was some talking scenes, a sex scene, and an all-too-boring dragon fight. How did they manage to make a dragon fight seem boring? I really hope this was just a bad demo.

Mass Effect 2. The opposite of a serious disappointment. Holy crap this looks hot. Bigger story, better fighting, galactic dirty dozen 'suicide mission' vibe, and just a lot of the good stuff turned up to eleven. This can't get here soon enough.

Finally had time to take a look around. The floor had found an equilibrium that we can only hope keeps its balance in coming years. A good crowd on the floor, but not so many that you struggled with queues or crowds. It was even pretty easy to get pictures of booth babes. Not that we did. Definitely not about a dozen babes. None dressed as sexy nurses (thanks Trauma Team), and certainly none that roamed in packs of four. The babes were definitely a rarer species than in the days of yore. Do I lose my geek passport if I say that's not a bad thing?

The biggest issue of the show for folks like us? PC gaming is not in great shape if you take what's on show here as an indication of the future. Almost nothing is PC exclusive, which means almost all PC games on show are being built to be console friendly. And we know what that means.

Thanks be to the indie developer scene, which obviously isn't involved with a show like E3 but is now where we best find people willing to push the boundaries of what game experiences on our PCs can deliver.

But for those of us happy to cross the streams and play games on more than one platform, the outlook has rarely been brighter. E3 2009. The big show was back, and it could hardly be better.

Official E3 Game Critics Awards list

Best of Show
Uncharted 2: Among Thieves (PS3)

Best Original Game
Scribblenauts (DS)

Best Console Game
Uncharted 2: Among Thieves (PS3)

Best PC Game
Star Wars: The Old Republic

Best Handheld Game
Scribblenauts (DS)

Best Hardware/Peripheral
Project Natal (X360)

Best Role Playing Game
Mass Effect 2 (X360 / PC)

Best Action Game
Modern Warfare 2 (PS3 / X360 / PC)

Best Action/Adventure Game
Uncharted 2: Among Thieves (PS3)

Best Online Multiplayer
Left 4 Dead 2 (X360 / PC)

Best Racing Game
Split/Second (PS3 / X360 / PC)

Best Sports Game
Fight Night Round 4 (PS3 / X360)

Best Fighting Game
Tatsunoko vs. Capcom:
Ultimate All-Stars (Wii)

Best Strategy Game
Supreme Commander 2 (X360 / PC)

Best Social/Casual/Puzzle
DJ Hero (PS3 / X360 / Wii)

Ghostbusters: The Video Game

Does authenticity equal a good gaming experience?

For a while, it looked like this was a game that would only ever be vapourware, like some ghostly Duke Nukem Forever. The Activision Vivendi merger left the game on shaky feet, but thankfully it's finally out; instead of chewing our nails wondering if it's going to be good, we can waste endless hours wondering if it is actually good.

Or, you can just read this review, because the short answer is: yeah, it is in fact pretty damn good!

Probably the best thing about the game is just how welcome it is to hear the original cast at work, and how comfy they all still are with their characters. Bill Murray is laconically sarcastic, Harold Ramis still sounds stuffier than a stuffed thing, Dan Ackroyd seems to be having as much fun voicing Ray Stantz as he did playing him back in the eighties. On top of that, the game's dialogue has been worked on by Ramis and Ackroyd. It's essentially Ghostbusters 3, and in many ways it's a funnier piece of work than Ghostbusters 2 ever was.

The game opens two years after the second film, as the firm is training its latest hire – you. The old gang's been getting lots of work, and Egon's come up with a number of improvements to the proton pack and other ghost-busting gear. That's, effectively, your job – to make sure none of it's dangerous. Some wisecracking later, the main part of the plot starts to kick in.

And did we mention there's a major Gozer exhibit opening up, at the same time?

So yeah, you get to face a lot of classic enemies, as well as new entities and bosses, in a number of more or less authentic New York locations. One early sequence even involves a flat-out running battle with our old friend the Staypuft Marshmallow Man.

And no, this time it's not Ray's fault.

The meat of the game is basically you, backed up by the occasional partner, running around trying to zap ghosts. Smaller emanations can be neatly destroyed just by playing your proton beam over them; larger ones require somewhat more finesse to first wear down, and then capture ("I looked into the trap, Ray!"). In fact, it's this mechanic that really gives the game a unique sense of actually, well, trapping ghosts!

First, you've got t0 nail a nasty with your beam, this draining it of energy. When it's lost enough energy, you can switch on a containment beam, and actually start maneuvering it around; it might fight, so you can also slam them into the ground to daze them for a bit. It's kind of like reeling in a fish, actually, and if you're anything like us you'll be leaning half out of your seat with your arms at full stretch, trying to will ghosts into each freshly deployed trap. And quite possibly making silly faces, with your tongue stuck half out in child-like concentration.

To follow with the "Let's split up, we can do more damage that way" feel of the films, much of environment is destructible, and pleasingly so. It's no Crysis or Far Cry 2, but it's nonetheless satisfying to survey the scene of a nasty tussle between you and your 'buster pals and some evil spirits, and then spy the flaming scorchmarks, broken furniture and over-turned wedding cakes.

It's not a perfect game by a long shot, but it does have the same collegiate feel as the first film, much the same comedy stylings, and some truly unique gameplay. It's the kind of game you'll enjoy as much for Bill Murray's line readings as you will any of its set-piece battles. And that's enough for us. **DH**

PS3

Developer Terminal Reality
Publisher Atari
Website www.ghostbustersgame.com

Graphics Not the greatest, but they do the job.	79
Gameplay Fun, with lots of variation in baddies.	83
Sound Original cast and music really shines.	93

Overall
Not the deepest game, but one of the most entertaining.

80%

Red Faction: Guerrilla

Blowing stuff up for fun, profit, and the right to live free on Mars.

Red Faction's one of those game's that's always threatened to become a breakout franchise for THQ and Volition, but it's never quite hit the stellar heights of more popular games. They've always been fun, at the very least, and showcased some great phsyics and graphics, but the game's seem held back by not quite solid enough plotting or strong enough characters.

The latest, Red Faction: Guerrilla, is almost the Platonic ideal of the series: fun, awesomely destructive, but still leaving you slightly hungry for something... more.

You're cast as Alec Mason, who has recently returned to Mars, only to find it over run by the harsh regime of the Earth Defence Force. There's an in-game cutscene full of all the hallmarks of brutal oppression – beatings, shootings, lots of tense looking guards wandering all over the place – followed by a brief but illuminating training level. It's here that you start to learn the destructive potential of Guerrilla, and let me tell you, it puts a smile on your face.

Essentially, you're mining for scrap, and you've got to pick it up from the environment, or smash the living crap of buildings to create it. To this end you've got your trusty hammer (with something like the destructive potential of 500lb bomb) and some charges to destroy a few structures. So, like any self respecting reviewer, we thought we'd really test the phsyics engine.

First up, a circular tower. In previous Red Factions there were some hiccups with destructible terrain that could leave a structure standing that was no longer actually touching the ground. So, to see if this was still a flaw in the Geo Mod 2.0 engine, we proceeded to smash out the ground level walls of the tower. It stood resolutely and improbably tall for a time, but as we neared the final wall sections still holding it up it let out a shuddering groan as the remaining support structures buckled and the tower fell in a heap.

On poor intrepid Alec.

But, despite the personal loss, we were impressed, and so we tore off into the game world proper for more things to destroy.

Guerrilla's gameplay is of the open world model, presenting you with a series of regions you need to effectively free from the clutches of the EDF. Each region features strategic assets you can destroy (bases, bridges and mining operations), as well as more story-based missions that advance the rather thin plot (EDF Bad! Miners good! Destroying fun!). How you progress is pretty much up to you – you can ignore a lot of the set missions, and instead focus on taking out EDF forces, you can finish the story, or you can simply run about causing all kinds of environmental catastrophes. The game takes its name, too, from the fact that stand up fights are usually a losing proposition – you must use hit and run tactics to survive. In all of this, the surprising depth of the Geo Mod engine provides the most entertainment.

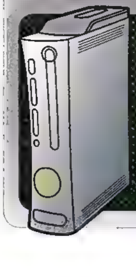
In fact, where it not for the level of mayhem you can cause, the game would be rather dull. The voice acting is corny at best, the plot limited. The regions also seems a little on the small side, and the hit and run gameplay can at times show up the poor enemy AI. Not to mention that while you've got some wonderfully destructive weapons, the actual combat is a little anaemic But every time the game threatens to become dull, a random patrol shows up, or you crash into the wrong vehicle, or some other semi random bit of destruction happens that leads to a big, brawling fight that leaves building aflame, rubble strewn everywhere, and you with a big silly grin on your face.

There's a skill system and gear purchasing mechanism in place, but this is not a game about that kind of depth. With a bit more polish on the story and mission system, and more competent AI this could be a great game to rival Far Cry 2, but as it is it's merely good, destructive fun. **DH**

PC, PS3 Xbox 360 (reviewed on 360)

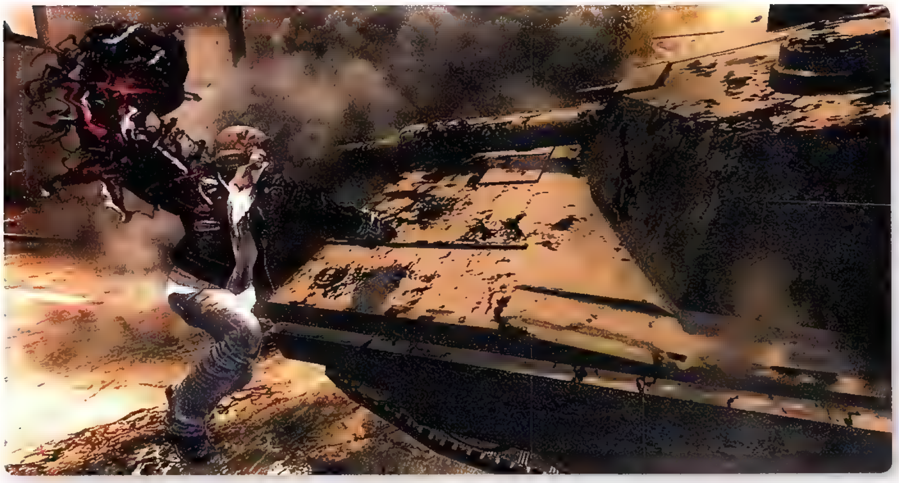
Developer Volition
Publisher THQ
Website www.redfaction.com

Graphics A little pedestrian, but good enough. Geo Mod great, though.	76
Gameplay Rich and varied, though not deep.	81
Sound Bad voice-acting, good explosions.	74



Overall
Brilliant physics can't quite make up for the game's weak points.

77%



Prototype

Forget good and evil – this open world tale's purely about revenge.

We almost didn't get a chance to get into Prototype – our first attempt at playing through was on PC, and it was abortive at best. It appears there are a host of bugs afflicting the superior platform, bugs which just happened to render our version of the game eerily silent, choppy as all hell, and less fun than getting a poke in the eye with a mutant claw. Thankfully, though, we sourced an Xbox 360 version of the game, and we're glad we did (for more details on the PC issues, see our site: **www.atomicmpc.com.au/?147499**).

Prototype casts players as Alex Mercer, your typically amnesiac test subject who's recently shuddered back into a semblance of life following waking up on a morgue slab. The game starts in media res, with Mercer fully evolved, and with the city in the throes of a full outbreak of mutant infection. Then we dash back in time to see how it all started.

What follows is part detective story, as Alex traces his own history while unlocking the mystery of who made him what he is, and part destruction-fest as Alex uses his newfound and growing powers to achieve the former goals.

Actually, it's mostly a destruction-fest. And a fun one too.

Mercer's new powers revolve around a rather nasty form of shapeshifting that his given him not only neat new forms to play with (scythe hands, shield-limbs and so on) but which have also made him super-fast and super-strong. He's also an agile fella post-infection, and capable of neat tricks like running up walls; and not just Neo style, we're talking running up the glass-windowed facade of a towering skyscraper, leaving behind a trail of shattered windows and gawking bystanders. As whatever's infected Mercer starts to get out into the city, civilians start to change into a variety of zombie-like forms, and the military gets more involved, sending in tanks, choppers and full kill-teams to handle the infection – and you.

There's a number of neat game systems in Prototype that really make you feel hunted. As you dash about the city, if a soldier spots you, it might call in some friends or open fire. Continue the engagement, and response teams will be radioed in; unless you kill the soldier making the call. Further, as you consume people who might have clues about your past (did we mention that Alex is having a REALLY bad day? Simple interrogations are right off the menu), you unlock nodes on what's called the Web of Intrigue. These are snippets of memory, either pertinent to the mission at hand (the location of a vital character or objective) or to unlocking the game's plot (such as the fact you have a sister and the army's after her, too).

All of this story, combined with the open world, and your powers (which you earn XP torward, and which you can therefore upgrade and customise as you see fit) adds together to deliver some stunning action, and some widely different gameplay elements. You can take the form of people you've consumed, thus letting you sneak by roadblocks or lose aggressive kill-teams; or you can tear bits of buildings off and toss them like wadded up paper to take out pursuing helicopters. Big fights are as likely to happen on a rooftop, with bodies flying off into the blue at your every blow, or on the city streets, where not only bodies of badguys, but luckless civilians and even cars can be flung around in the melee. The level of destruction is cleverly applied, too; a perfect example is the crater you leave when landing from a great height. Small jump, small crater – larger drop, and you not only crater (well, actually it's a 2D texture, but in a game this busy that's okay) the ground for some radius, but you also fling vehicles and bystanders dozens of yards. No other game has quite gotten this sense of Godlike power quite this viscerally right.

Some have critiqued the game for being without any moral framework, but to be honest, we prefer this greyness to inFamous' false Good and Evil dichotomy. You can try to preserve civilians – or not – and all you'll get is a kill-count at the end of each mission. The morality is for you, the player, to decide. It works for us, anyway.

Despite its plot, there's not a lot of depth to Prototype, but the frenetic and over the top action more than makes up for any perceived lack. And if the cheering during some of our play sessions is anything to go by, this is even a game that's as much fun to watch as it is to play. **DH**

PC, PS3 and Xbox 360 (reviewed on 360)

Developer Radical Entertainment
Publisher Activision
Website www.prototypegame.com

Graphics Varied and visceral and violent.	85
Gameplay Not the flashiest, but does the job and runs fast.	76
Sound Delicious in 5.1.	87

Overall
A lot of violent fun, with added emo psychosis.

79%

Bloodbowl [PREVIEW]

A computer game based on a board game based on a real sport. Huh?

When most people think of either of the Warhammer worlds (assuming they think of them at all), they think of grim futures full of war or dark forests haunted by chaotic mutants. But what many don't realise is that there has always been a lot of tongue in a lot of cheek in the creation of these worlds. One example of that is Bloodbowl.

Bloodbowl was a miniatures-based boardgame released back in the eighties. In it you fielded a team of orcs or elves or dwarves (or any number of other Warhammer races) in a game of brutal fantasy football with a rough resemblance to Gridiron. The rules were typically over the top, allowing for in-game fatalities, the throwing of other players (if, for instance, your tiny goblin has the ball, your big and strong troll can toss the player ball-and-all into the touchdown zone), and limited use of magic.

It was chaotic, very colourful and a helluva lot of fun – especially if you could get a dozen friends together into League, where you could advance your team, earn experience, and even swap Star Players.

The game is still supported to this day, and it's this Living Rulebook 5.0 that the latest Bloodbowl computer game is modelled on.

In fact, it's those exact rules that have been used, leaving the game to be little more than a computerised front end for the game. And you know what – that's fine by these old Bloodbowl veterans.

Our preview code limited the teams we could create to orcs or humans (the full game will have elves, lizardmen, undead, dwarves and more), and many or the graphics were placeholders, but the spirit of the game comes across wonderfully. For those who don't know the original game, it's all pretty simple. You place your team, as does the opponent, either by choosing a preset defensive or offensive pattern, or to a scheme of your own design. You've got Blockers, Linemen, Catchers, Throwers and the allround stars of the game, Blitzers. You'll have limited numbers of each, so clever use of allrounders and husbanding of your more specialist players (ie, don't field Throwers when you're going to be on the defensive) is one of the keys to victory.

All action is based on movement points, like a lot of the military sims of yore, so you'll spend a point to move, or throw the ball. If you don't move, you can try to tackle a player, knocking him down or even, if you're lucky, injuring him and taking him out of the game entirely. There's a wrinkle though; as soon as you drop the ball, or one of your players gets knocked over (your opponent can attempt a tackle when you move through any square adjacent to them), your turn ends. Deciding what order to move your players around is actually more important than what you get them to do. It provides a clever depth to an otherwise simple game.

All of the resolutions mechanisms are based on virtual die rolls, using the same mechanics of the Living Rulebook 5.0. In fact, these rules come with the game, meaning that this is either going to be easy to pick up for a veteran player, or a great way for a new player to learn the game.

What's more, you can even play the entire game in a live mode, which plays more like the EA sports titles. We think the boardgame mode is more fun, but it's nice to have the option.

We're already impressed with the solid core of the on field game, and the campaign system gives the game a lot of replay value. We're hoping a few more player animations make it in, and the game will be much better when all the assets are in place, but already we're having hoot. **DH**

PC and Xbox 360 (previewed on PC)

Developer Cyanide
Publisher QVS Software
Website www.bloodbowl-game.com

✓ Simple gameplay; hidden depth; throwing goblins for fun and profit.

✗ Not a lot of graphic variety; sound in the preview is shallow and tinny.

Anticipation rating
At last, a reason to admit I'll never paint my own team.

83%

Resellers

VIC

Centre Com	www.centrecom.com.au
CPL Distribution	www.cpl.net.au
PC Case Gear	www.pccasegear.com.au
Scorpion Technologies	www.scorptech.com.au

NSW

IJK	www.ijk.com.au
IT Estate	www.itestate.com.au
Skycomp	www.skycomp.com.au
Techbuy	www.techbuy.com.au

QLD

ITS Direct	www.itsdirect.com.au
Umart Online	www.umart.com.au

SA / All States

MSY Technology	www.msy.com.au

WA

PLE Computers	www.ple.com.au

Distributor

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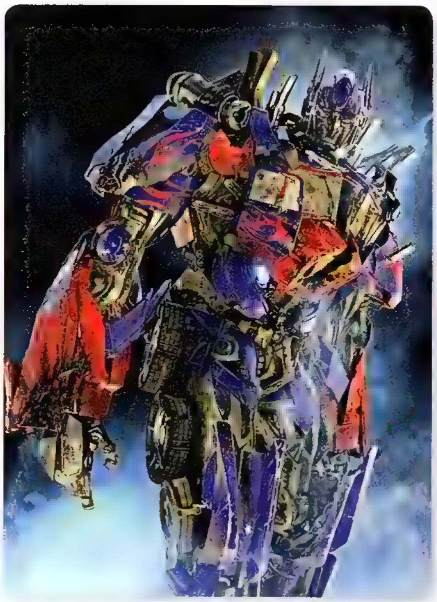
THINGS TO SEE



Transformers: Revenge of the Fallen

Michael Bay ramps up more of everything in the latest Transformers film.

Distributor DreamWorks SKG **Director** Michael Bay
Starring Shia Lebouf, Megan Fox, more voice talent than you can poke a stick at.

I'm not saying that Transformers: Revenge of the Fallen is bad, as such, but I do want to punch Michael Bay in the crotch if I ever meet the man.

This isn't a film that starts at zero and speeds up sedately to 60mph in a nice linear progression, oh no. It's a Michael Bay film, and since he believes cinema audiences are ADD freaks with popcorn, Revenge starts instead somewhere in the vicinity of 100mph and then proceeds to ramp up like a Bugatti Veyron on crack. To say the pace is relentless is an understatement.

Revenge kicks off with a stentorian voice over from Optimus Prime (and let's face it, when you have voice-talent like Peter Cullen, you use it for all it's worth!) and cavemen fighting robots (I shit you not), before dumping us in the middle of an anti-Decepticon search and destroy mission headed up by the troops of NEST – a joint human-Autobot taskforce. Turns out Demolisher's been hiding in Shang-hai, so half the city gets driven over by his giant robot wheels before Optimus Prime is dropped out of a C-17 to take the giant bot baddie out.

Yes, dropped out of AN AIRCRAFT.

The opening fight pretty much sums up every other beat of the film. Humans get in over their heads; Autobots show up to save the day. Rinse and repeat. This rhythm is only broken up by Megan Fox or Isabel 'Aussie-girl-made-good' Lucas pouting at the camera or taking their clothes off, or crude, near scatological humour. It's about 90 per cent explosions, 10 per cent waiting for explosions.

Megan Fox quite publicly admitted that Revenge is not a film that's about the performances, and that's bang on. And a good thing, too, as her turn is actually more robotic than any Autobot's; that said, it's hard to take her to task over it, when Bay's direction was probably more of the "Pout more! Scream! Stick your breasts out! Run from the pretend robots!" variety. Shia LaBeouf (which, you may be unaware of, is French for Share the Beef – true story) hands in a workmanlike performance, and he delivers some wonderfully comedic moments. John Turturro returns as the paranoid Agent Simmons, and is – as always – a pleasure to watch, though it could be argued that his talent is vastly under-utilised in a film like this. Josh Duhamel looks pretty, and that's about all we can ask of him.

But talking about the quality of the acting and writing in a film like Revenge is like talking about the quality of cloth on the table when you're having dinner at Tetsuya's – it's beside the point. Say what you will about Bay, but he certainly

> Humans get in over their head; Autobots show up to save the day. Rinse and repeat.

puts all the gazillion dollars of effects money up on screen or has it blaring from the cinema speakers. It's a testament to the continuing skill of the guys at Industrial Light and Magic that the various robots, whether crashing through walls or standing proud on the bow of an aircraft carrier, never look or sound anything less than 100 per cent real.

Longtime fans will be very happy to see Soundwave finally make it to the bigscreen, floating around in orbit tapping into various military satellites via glowing, nanite-like tendrils. It's actually a pretty spooky effect. Starscream returns, as does the deliciously voiced-by-Hugo-Weaving Megatron. On the Autobot front the characters are less pleasing, and in fact borderline racist – Mudflap and Skids (The Twins) are vaudevillian renditions of slapstick depth and vile stereotyping.

You know – like Martin Lawrence and Will Smith in Bad Boys.

But for every time The Twins crack wise to please the cheap seats, along comes Optimus Prime to offer some deep-voiced wisdom, or Ironhide does something cool with a big shiny gun.

And that's really the trick that Bay seems to have pulled off yet again if the audience applause that greeted the premiere screening is anything to go by. There's simply so much thrown at the screen, from fart jokes to robot decapitations to Megan Fox's pout, that some of it's bound to entertain. Sure, the film takes way too long (and don't get me started on the fracking robot angels in Autobot heaven), and the level of exposition in some scenes threatens to sink the entire film, but before long you're lost in another robot on robot fight, or – like me – simply enjoying the silly pseudo-military babble all the special forces types are spouting.

Hell, even I peed my pants a little when a RAIL-GUN-ARMED-NAVAL-DESTROYER takes out the giant Constructicon Devastator while amphibiously-deployed M1 Abrams tanks pound other Decepticons into scrap. I'm only human.

But I still want to crotch-punch Michael Bay. **DH**

Overall

Too long, too loud, too dumb... but still annoyingly entertaining.

69%

DISC OF THE MONTH

Let The Right One In

Forget Twilight. This is the best vampire story told on film this year.

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LET THE RIGHT ONE IN
A FILM BY TOMAS ALFREDSON
"BEST. VAMPIRE MOVIE. EVER."
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Twilight, for better or worse, has well and truly entered and subtly changed the vampire landscape. Creatures that were once bywords for forbidden sexuality and animal hunger have now been reduced to frottage-happy, sparkling pretty boys. The de-sexualising of the vampire has in fact pissed off director Guillermo del Toro (Hellboy, Pan's Labyrinth) that he's written his own vampire novel to try and put some teeth back into the mythic creatures. But, for our money, there's no better cure for the Meyer-induced malaise than the Swedish film Let The Right One In.

Based on the 2004 book of the same name, by John Ajvide Lindqvist (who also scripted the film), Right One is the tale of the lonely and bullied Oskar. As a 12 year old boy with a rather... sensitive nature in eighties Stockholm, he's a perfect target for the rough attention of his peers. He lives with his mother, and regularly visits his father, who takes him for snow-ski rides that are the only thing that seems to provide relief from the relentless bullying.

Until he meets Elli, a girl his age, with an odd indifference to the knee deep snow of Stockholm in the winter.

This isn't a film that you want to over explain. It's a delicate love story, a tale of coming of age, and a bloody (literally) vampire masterpiece. There's not a single aspect of the film that's not been carefully handcrafted to deliver the maximum impact – the score is haunting and beautiful, the cinematography is elegiac, spending as much time on falling snow as it does on lingering shots of the lead actors. And such leads – though young, Kåre Hedebrant as Oskar and Lina Leandersson as Eli deliver stunning and moving performances.

For a vampire love story with real teeth, Let The Right One In delivers in artistic spades. **DH**

Overall

A quiet and beautifully shot masterpiece.

90%

At The Mountains of Madness

There are some deals no sane man should ever make...

4.55pm: It's thirty five minutes 'till, technically, the office closes. It's deadline day. All the magazine is done, proofed, read-through, laid-out, scrutinised, lightly buffed with some kind of shiny-coolness-giving device. All except for this one page.

The page I stupidly said to Justin "Yeah, I'll take Fallout this month! How hard can it be?"

Somewhere, a wolf howls.
The page stares at me, taunting, flaunting it's emptiness at me.

Fuck.

4.57pm: Well, that filled a bit. Entertaining? Who knows. Wait... was that a wolf? How in the name of Atomic did a wolf get free in North Sydney?

Oh no. I have... the Deadline Crazy.

4.58pm: Yes. *The Deadline Crazy.*

5.01pm: Read the forums a little. Wolf still howling. Hectorbustnuts has a terrible sense of humour, but that won't get this page written any faster.

Wait a minute...

Hawkeye: Hey, say something witty for the back-page column this month, hector!

5.05pm: Hit refresh on my PM inbox three times. Damn bastard's *ignoring* me. Well, he'll regret that...

5.08pm: Maybe I can get some inspiration playing with the toy robot that THQ sent to me with a copy of Red Faction. Hee. I'm making the robot dance!

5.10pm: The robot broke. I really liked that robot.

5.13pm: 223 words. Now 226. Wait... make that 230. No, now it's 234. Plus one. And those words. And... *twitch*

Where's hector?!

5.20pm: Damn, got distracted talking to DesignDave and ProductionEwa. As it turns out University seems to be only good for getting a really huge HECS debt. Good to know. Now I can hear them talking... about Chris Taylor. Who still hasn't delivered .edu! Dammit man, the pub! The pub's *beckoning!*

Though, if I go outside, that wolf sounds damn hungry. Hmm. Where's that bottle of whiskey I hid around here...

5.26pm: Four minutes to go! Urge to check word count, rising... but I won't make that mistake again. My mind still fears that endless vortex of contradiction.

336 words... *SHIT!* Be calm! Breath... yes... that's it. Where in all the Hells is hector?

5.30pm: Waved at Sam Askin, our online ad girl. Yeah...

Not nearly as entertaining or content generating as I had hoped.

5.38pm: Saigon. Shit. I'm still in Sai... no I'm not!

Hawkeye: I'm serious man - help a brother out!

hectorbustnuts' eyeballs don't play well with Colgate Plax.

5.41pm: Curses! Facebook status reports! There is no God!

hectorbustnuts thinks there's not a single sport that wouldn't benefit from a multi-ball system. 'MULTIBALL!' And a dozen balls drop into the arena and then all shit breaks loose.

5.42pm: This is inhuman!

hectorbustnuts loves having a wee-wall in his house. Sure it's deeper and wider...and everyone else calls it a 'bath'...

5.43pm: I DON'T NEED TO KNOW THAT!!! Breathe Hollingworth, you're nearly there.

hectorbustnuts: Hey, I'm back.

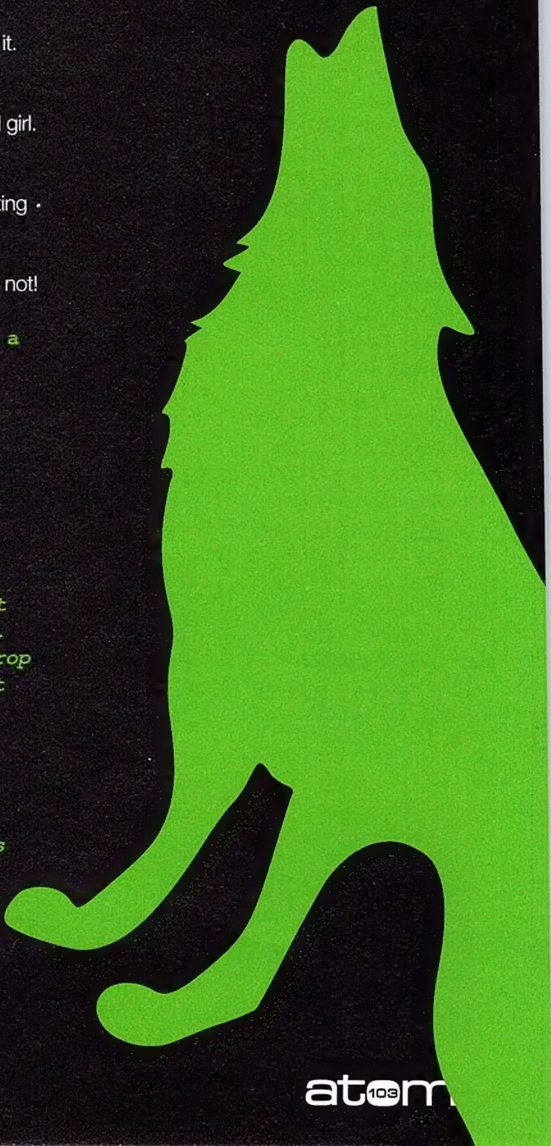
What do you want?

Hawkeye: GET AWAY FROM ME YOU FILTHY PERVERT!!!

5.43pm: That was close, I... hey... the air-conditioning just got turned off...

hectorbustnuts is bringin' bird-flu back with a vengeance! Now, hand me that syringe and pigeon...

AAAAARRRRRRGGGGHHHHHHHHHHHHHHHHHH



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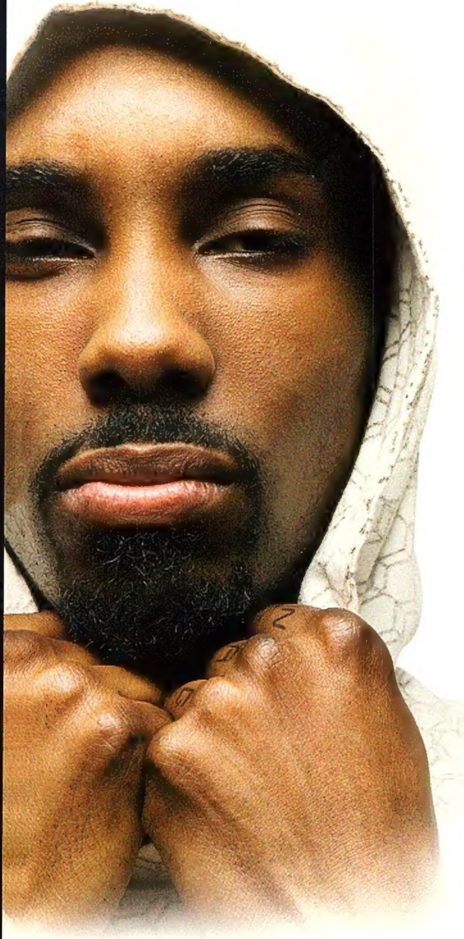

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